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(From *La Lumière Electrique.*)

Munich Exhibition.

APPLICATIONS OF ELECTRICITY TO THE LIGHTING OF SCHOOLS OF DESIGN, MUSEUMS AND ARTISTIC COLLECTIONS.

The old capital of Bavaria, so celebrated for her schools of painting and sculpture, and immense artistical riches, in her first electro-technical exhibition could not fail to reserve a large place for the application of the new lighting processes in the sundry manifestations of art.

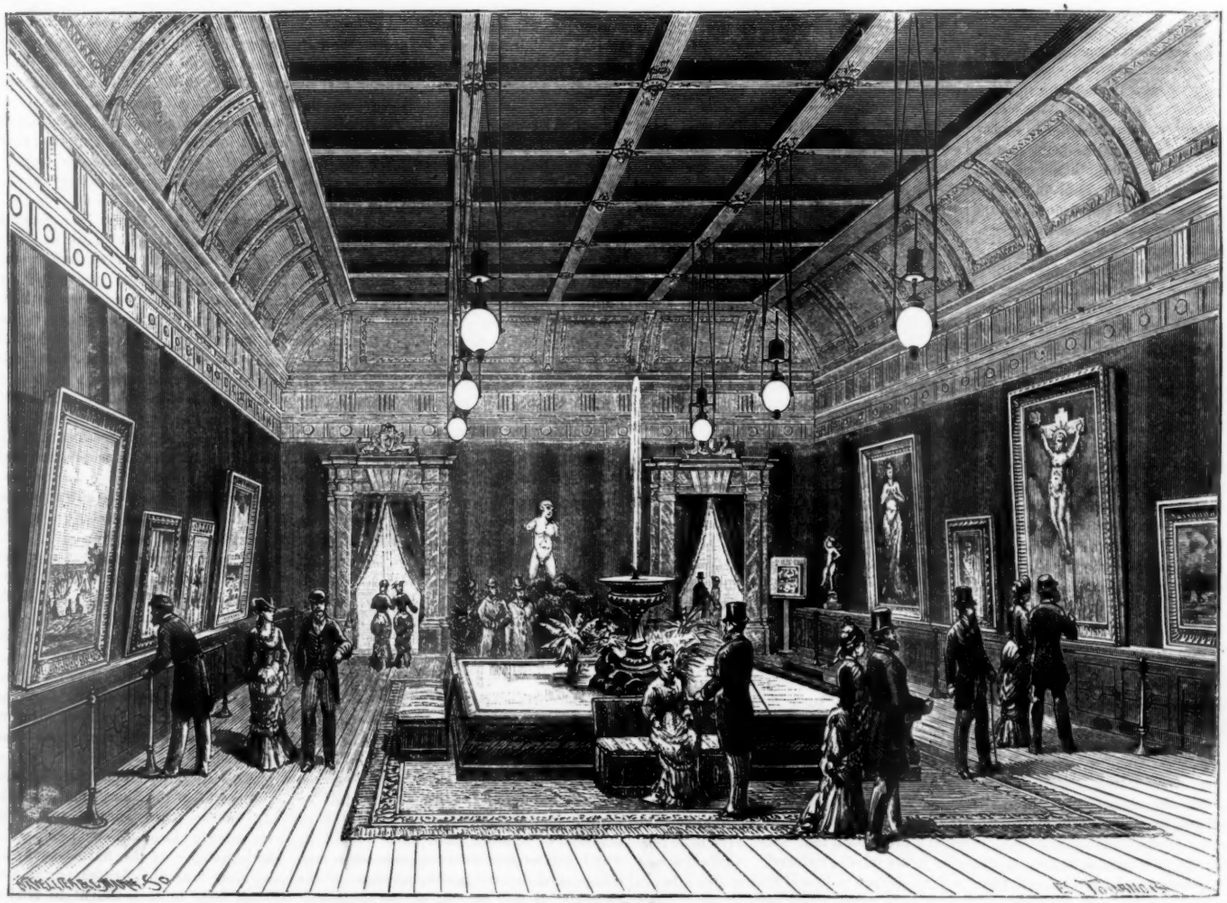
It is generally known that Munich, from its very foundation by Henry-the-Lion in 1158, saw arising one after another diverse monuments which seem to have been constructed for an immense city, though its population does not amount at present to over two hundred thousand inhabitants all told, including the population of its suburbs. It is mainly about the seventeenth century, during the reign of Maximilian I., that its artistical reputation began; that prince having passed several years of his youth in Italy, brought back with him a very well marked taste for arts; from the very beginning of his reign he took care to give his capital an aspect of grandeur and elegance which already commanded the admiration of all the strangers. The sovereigns of the last century, and King Louis particularly, also continued with ardor the construction of cathedrals, palaces and museums, and already under Joseph Maximilian IV. the plan of Maximilian suburb was conceived, which has since become the new city, and in which nearly all the grand modern buildings are gathered. From 1825 to 1848, under the reign of King Louis, the most of those edifices were constructed; we can admire under different points of view the new Palace, the Church of St. Louis, the Basilic, the Glyptotheca, the Pinacotheca, the Odeon, the Library, the University, the Factory of painting on glass, the Ruhmes-halle, the Siegesthor, the Isarthor, the Feldherrn-halle, the House of Education for Noble Young Ladies, &c., nearly all these monuments contain collections which are unique in the world, and have attracted into that centre so well fitted to entertain the sacred fire of art, a multitude of workers, a few of whom have acquired great celebrity.

Under the successor of Louis I., who was his eldest son, Maximilian II., they began the erection of the vast Grain Exchange and the Crystal Palace, intended for exhibitions, the Railway Depot, the Winter Garden, the Physiological Institute, Maximilian street, one of the most beautiful streets of Munich, the Government Palace, the National Museum, the Maximilianeum. On the 10 h day of March, 1864, the King died after a short sickness, and left his throne to his son, Louis II., who has continued the noble traditions of his ancestors.

The antecedents of the city of Munich and the love of art which she continues to honor with such earnestness, were a sure guaranty of the efforts which would be made during the exhibition of 1882, to show all the advantages which can be drawn from electric light intelligently applied, either to light in the evening the schools of design, or for the courses of painting, or else to study masterpieces of the masters at much more convenient times and without being restricted, as it has been until now, by the duration, so variable, of the daylight.

Consequently, from the first beginning of the installation of the diverse parts of the Crystal Palace for the opening of electricity exhibition several rooms had been reserved to show the applications of the electric light to artistical productions. One gallery of paintings, one model of school of design, one chapel with its effects of carved woodworks, its gothic ornaments and accessories of all kinds, had been arranged by the committee of organization. The gallery of paintings, of which we give, Figure *A* herein, a general view, was indebted to Mr. Gedon for the favorable disposition it presented; red tapestries covered all the panels of the large hall, and formed a very well appointed ground to give relief to the wide golden borders of the paintings, and above all to the painted works they were surrounding.

There were for the communications with the neighboring rooms three rich doors in simile-marble of grand and severe archi-



THE HALL OF PAINTINGS.

tecture, which harmonized in the best way with the rather dark shades of the general decoration; in the centre of the room a large rectangular basin, bearing in its centre a *cangue* or fountain from which a jet of water escapes, as shown per Figure A; green plants and shrubs, decorative figures borrowed from the plasters collection of the University, completed the whole, which the intense light of the regulators animated and enhanced with an incomparable splendor. Nevertheless, such decorations were only accessory parts, since there were gathered in the gallery a series of paintings of the best artists of Munich, amongst which we may name: Gabriel Max, Franz von Lenbach, Fritz Aug. Kaulbach, Piglhein, Hermann Scheinder, Albert Keller, Joseph Brandt, Gedon, Neubert, V. Miller, V. Cramer, who had graciously sent their works. The firms Humpel-Mayr and Fleishmann, of Munich, Lehmann, of Prague, had also placed very interesting paintings at the disposal of the committee.

Unfortunately the lighting of the gallery of paintings was not in operation during the first days of the exhibition, the firm Siemens & Halske, of Berlin, having failed to enable their representative, Mr. Riedinger, to set his apparatuses into operation, the installations had been delayed so long that it had become impossible to make the necessary experiments. It was only towards the end of the exhibition that the gallery was properly lighted with the lamps of Schaeffer, of Goeppingen (Weston).

Although continuous experiments could not be organized in order to appreciate the effects of light in the gallery of paintings, nevertheless they could reckon the services which the new light might render in replacing daylight, and it was demonstrated that arc-lamps could easily supply the place of sunlight. Mr. Franz von Lenbach, in his studio, placed himself at the disposal of the committee to prove that it was possible to paint by electric light.

The celebrated painter, at whose studio one arc-lamp had been installed, gave sittings in painting showing that, by turning the luminous rays directly upon the canvas, from the left side and backward, one could work as well by full daylight; during those experiments he finished a portrait and it was demonstrated that the models had the same fineness of tones as in the works of the same author executed in daytime.

The committee was thus enabled to acquire the certitude that by using the arc-lamp of Mr. Schuckert, which was used in that essay, the most delicate tints could be distinguished on the palette and the mixing of any colors could be executed to produce all the tones of the most delicate carnations. In that studio, of limited size and quite filled with sketches and studies with colors yet strongly accented, the electric light did not appear as it might have been expected, of a bluish and cold tone, but it was warm like sunlight, mainly after remaining in the room for a certain length of time. That result then shows distinctly the possibility of rendering galleries and museums accessible in the evening; that would constitute an immense advantage for the persons who are engaged in the study of drawing and painting, and thereby still more activate the art production.

According to the official report of the Munich International Exhibition of Electricity, the best methods of obtaining an electric light suitable for art galleries would be the following, which, for sundry reasons could not be experimented upon at the Bavarian Crystal Palace.

The first method was the one which had been put forward by Engineer Oscar von Miller, after the Jaspar's system; it could not be used because a sufficient amount of light had not been placed at his disposal.

He proposed the lighting of the gallery of paintings by means of an arc lamp of at least 10,000 candles, installed in such manner that the focus should remain hidden to the eyes of the spectators and light the pictures by double reflection. A fountain with basins built in the middle of the room would have formed the support of that lamp and its upper part would have been constructed in the shape of a reflector. The light emitted that way and the one thrown back by the reflector would have been received and reflected by a white and golden ceiling, in which a light tint of yellow might have been mixed to give a warm tone to the light. It was by means of that ceiling that the light would have been thrown back on the walls and lower parts of the room. By that method of lighting, a very regular light might have been obtained, which would have produced an agreeable impression on the eye, and which, probably, as diffused light in general does, would have produced, a very good effect on the pictures. Some preliminary experiments made before the exhibition by the firm Riedinger, in the presence of several artists, at Three-Moors Hall, in Augsbourg, have shown, as it was ascertained in the Lenbach's studio, that direct electric light greatly increases the effect of pictures.

Another method for the lighting of galleries of paintings would have been by constructing a double ceiling in that hall and installing in the space between them a certain number of reflectors, in the interior of which arc-lamps might be placed. The shape of such reflectors is very important, because it is known that arc lamps especially send their cone of light backwards, and reflectors placed above such cone would be perfectly useless. Then if we want to light with great intensity the walls of a gallery of paintings, in the first place the transversal section of the reflector must be placed obliquely to the direction of the wall, moreover the profile of the section must be so calculated that it will embrace the greatest part possible of the cone of light.

That system would procure such an advantage that the walls destined to receive the paintings only would receive the bright light, whilst, as in the first method, the spectators would be completely preserved from the direct effect of the intense light of the arc. They could then devote themselves without trouble to the examination of the art works.

A circumstance which caused some unpleasantness at the exhibition in consequence of the use of uncovered arc-lamps was developed, because incandescent carbons will throw continually fragments, more or less large, which will soon soil the surface of the reflector placed underneath and require frequent cleanings. Globes of transparent glass can only be used in such cases when they are perfectly free of defects, for the least grain or any other irregularity in the glass will produce on the pictures some very unpleasant shady effects, which, above all, must be avoided. In all the installations of electric light for art galleries we must proceed in such a way as to get the lamps as much as possible placed so that they act in square proportions of space of the surface. It will also be important to find the shade of color to be applied on the surface of the reflectors in order to communicate to the reflected light the tone most favorable to paintings. It is more difficult to reach such result with colored glasses, because their surface is too limited to influence sufficiently the mass of the light of an electric arc-lamp. To obtain by that process any marked change in the shades of color, we must use so strongly colored glass that the intensity of light is diminished in such a proportion that bears very little relation to the effect produced. A reflector with a large surface produces that modification of light with much more efficacy and much less decrease of intensity, and such disposition answers much better all the exigencies of artists.

By the side of the gallery of paintings, which has been so arranged as to show how art works can be appreciated by electric light and what services might be rendered to the public by the application of the new processes in doubling the length of time during which art galleries and museums would remain open, *a model of a school of design* has been disposed in the exhibition. The painter Lenbach, by his finishing a portrait in his studio, as above stated, had demonstrated that artists shall not any more in the future have to battle with the difficulties encountered in the procuring of suitable light; such difficulties were often extremely serious formerly, when important paintings had been begun in the period of short days, and must be finished, as it is the case with us in Paris, at the very beginning of the spring; all the works being required to be terminated for the annual art exhibition in the course of the month of March. These days, when processes have become sufficiently practical, electrical installations will not be long in multiplying in private studios, and the dreadful days of winter, during which the night comes so soon, and which allow only short sittings, in consequence of the fogs and clouds which darken the sky, will no longer be insurmountable obstacles to the timely finishing of art works.

Whereas the Munich Exhibition was especially conceived in a practical point of view, it was natural that this most important question of lighting for artists should have been carefully studied in an experimental way; the committee of organization did not fail in his duty in that point of view. To that purpose a hall was disposed as a *school of design*, with tables for the pupils, models of ornamentation and sundry specimens of moulding in antique statuary; the whole of it lighted by a series of incandescent lights, waiting only for the growing artists and their professors to realize the value of the new light.

Such demonstration, moreover, was complete, as it may be seen by the following lines taken again from the official report:

"The experiments made rapidly in consideration of the importance of our evening schools were warmly encouraged by the faculty of the Munich School of Fine Arts, and Professor Straehuber did sacrifice a part of his vacation in the organization of the School of Design. The results obtained were very satisfactory, for it was ascertained that with the Edison light, used after the firm Siemens & Halske had withdrawn their concourse, the most delicate drawings could be done without any fatigue of the eyes. That was partly due to the weak emission of heat and the fixity of the light. Every evening some essays in drawing were made by the pupils of the School of Fine Arts and Industry, and in that case a number of continuous experiments could be gathered, which, as we have said, were most favorable to the successful establishment of evening schools lighted by the new processes furnished by electricity.

"When the time shall have come wherein incandescent light may be procured at moderate prices that method will get more and more appreciated for the schools of design, and generally for night work, since the fixity of the lamps of that kind is absolute, the distribution of the lamps, and consequently the diffusion of the light can be done with the greatest facility, and the light they produce, which becomes sufficient on the condition of multiplying the focuses, never has that polish aspect which can, with some reason, be reproached to candle light or certain regulators.

"School-rooms and amphitheaters lighted in that manner would constitute real benefits, and hereafter, when the costs of installation of electric light shall have undergone the natural reduction which cannot fail to happen, and when the general application of that kind of lighting shall have worked its way, it will no more seem comprehensible how it happened that the health and sight of the children, as well as that of the professors, were suffered to be injured in rooms lighted with gas. At the present time the price of the new light is not so high in relation to its precious qualities that it should not be promptly adopted in all the night classes where studious youths do gather."

The hygienic considerations into which the reporter indulges ought certainly not to be neglected, since the sight of the children who study drawing is very much exposed to to be injured, if those special studies are continued with the poor light of which we have made use heretofore; that is then a capital amelioration to be introduced in all important centres where the pupils meet in the evening schools of design, in the classes of living models for painting; that is no longer a mere amelioration, but a real creation, since it will thus make possible what could not take place when the sun had gone down below the horizon. There existed, it is true, a certain number of schools of design which took place in the evening, and in nearly all large cities, in Bavaria as in France, the academies of fine arts had their elementary courses in the evening to allow working youths, who are at work during the day, to attend the teaching of drawing which is so useful in all industrial applications. But it was only the line drawing, or at the most stumped drawing, shaded solids or study of antique, that were possible with the means of lighting we then possessed, none of the branches of painting, living models, landscape, historical composition, could be taught by gas light.

We have often recalled to mind that all the installations of the Munich electro-technical exhibition had been organized in an essentially practical point of view: thus, after having taken care of art in the museums and galleries, drawing and painting school rooms, as well as of the private works of painters, they gave their attention to the effects to be produced in religious exercises, which may, in the ceremonies of the Catholic church, find powerful means of striking the imagination of the flocks.

For that purpose they erected a chapel very mysteriously disposed under ogive vaults and windows with antique painted glass; inside, the altar with gothic sculptures rose majestically above four steps and was surrounded with large green shrubs which, under the radiance of the electric light brought forth the whiteness of the richly embroided cloth; in front stalls of dark wood, then on the sides, coats of arms, standards and the armor of some valiant knight formed a very well appointed decoration in the way of local coloring; on the altar, a candelabrum with seven branches and littapers, whilst on the tile floor, one of those apparatuses of wrought iron, intended to bear wax candles that faithful zealots do offer *in ex-voto* to the sanctorium ornamented the first plan. In order to make the illusion more complete, they had gone further, and since it would have been difficult to have, in that interesting chapel a real priest officiating before the public, a manikin skillfully draped and representing a prince of the church, clad with his rich sacerdotal vestments, was kneeling at the foot of the altar steps, and seemed to be reading the holy writ.

In order to give more precise details we had better reproduce the description contained in the report of the commission as far as it relates to the electrical application in the exercises of worship.

"The lighting of the chapel was made by the use of a Crompton arc lamp; there is no doubt *ab initio*, that a church might be lighted that way just as well as a railway depot or any other edifice, but that direct application of the arc seems to have something prosaic and profane, but the question was to ascertain if it were possible to light such a place with arc lamps without injuring its mystic character which excludes commonplace things.

"Mr. Gedon had organized that essay of lighting so that the focus should bear in full only on the parts wherein marked effects were expected in an artistical point of view. The remainder of the nave was then comparatively with the lighted parts, in a kind of half light quite sufficient to read easily and inducing to that interior concentration of the mind which is necessary to awake religious feelings. Mr. Gedon had neither lost sight of this, viz: that the use of electricity must not suppress the lithurgic tapers as it was shown by the votal taper burning in the chapel.

"An increase of such light, by means of incandescent lights, would undoubtedly produce a good effect, for those lamps do very well in decorative effects. An example, often cited, is the one of the motive crown suspended at the entrance of the chapel, provided with Greiner and Friedricks' lamps, and which produced a good effect. The lighting of that chapel was only an essay, but it has clearly proved the possibility of lighting churches with appropriate stateliness.

THE TELEPHONE CONVENTION.

Telephone Men from all Parts of the Country Meet in Cincinnati.

THE RISE AND PROGRESS OF TELEPHONY IN THE UNITED STATES—WHAT FOLLOWED A SMALL BEGINNING—THE DIFFICULTIES TO BE ENCOUNTERED IN INTRODUCING A NOVELTY—FEARS OF BUSINESS MEN CONCERNING ITS PRACTICABILITY GROUNDLESS—ENTHUSIASM FOLLOWING INDIFFERENCE—THE CLASS OF MEN SELECTED TO INTRODUCE AND PUSH THE TELEPHONE—GRATIFYING RESULTS OF THEIR EFFORTS—THE MEETING IN CINCINNATI—NAMES OF OFFICERS AND DELEGATES—REPORTS OF THE OFFICERS—EULOGISTIC DISCOURSE ON THE DEATH OF MARSHALL JEWELL, THE PRESIDENT OF THE ASSOCIATION—ELECTION OF OFFICERS FOR THE ENSUING YEAR—A COMPARISON OF PROGRESS MADE BY THE TELEPHONE—FUTURE PROSPECTS—THE NECESSITY FOR CONFINING THE TELEPHONE TO ITS LEGITIMATE FIELD—EXPERIMENTS WITH THE TLEPHONE OVER LONG CIRCUITS—DIFFERENCE BETWEEN SCIENTIFIC AND COMMERCIAL SUCCESSES—PLENTY OF WORK FOR THE TELEPHONE IN ITS OWN FIELD.

A few years ago a little instrument, by means of which distant sounds could be made intelligible to the ear, was publicly exhibited. It seemed a very ingenious toy—something that would prove quite valuable in the college lecture-room to explain the conductivity of various metals. Last week a body of men met in Cincinnati who control the working of nearly three hundred thousand of these instruments now in practical use.

The rate at which the telephone has grown into popular favor may truly be said to have been phenomenal, for it has never been equaled by any other contrivance, either mechanical or purely economical. It has left every other device, which has electricity for a basis, far in the rear, though there is reason to believe that other electrical devices are likely in the near future to show an equal progress in the commercial field.

But the telephone—useful, now well-nigh indispensable as it is—would by no means occupy to-day its high position in public estimation had not the proper men been found to direct its establishment.

Few are aware of the difficulties which stand in the way of an enterprise little understood by the public; that is to say, of introducing for commercial purposes a something which the business world, knowing nothing of its advantages, could not be expected to call for.

Mr. John Stuart Mill has told us that a demand will always bring a supply, but a supply will by no means insure a demand. Thus there was no call for locomotives or goloshes before they appeared, and it was necessary to show that the one would expedite travel and commerce, and the other insure dry feet, before the public could be awakened to the necessity for them.

In the case of the telephone large sums of money had to be expended in experiments, and intelligence of a high order secured to meet the difficulties that always stand in the way of a new enterprise, before the public could be made to believe that the system was of value from a commercial standpoint.

Right here it is necessary if we would understand why the telephone but a few years ago introduced, has made such rapid and at the same time steady strides into public favor, to turn for a moment to a consideration of the class of men which was at the inception of the enterprise chosen to lead the advance. Men of a purely business education would not do, for though they might temporarily encourage confidence in the scheme, they would when the long string of mechanical difficulties from which such an undertaking is never free began to present themselves, have been utterly demoralized and unable either to find a solution or to explain the cause of the trouble. Nor would men of a purely scientific and technical turn of mind fill the required conditions. The projectors of the great scheme were aware of the many pitfalls that lie in the paths of the purely scientific when, leaving their particular domain, they venture into the by-ways of commercial life. For the general error of those who possess powerful understandings is that they form schemes of too great extent and flatter themselves too hastily with success; they feel their own force to be great, and by the complacency with which most men survey themselves, imagine it still greater. They therefore look out for undertakings worthy of their abilities and engage in them with very little precaution, for they imagine that without premeditated measures they shall be able to find expedients in all difficulties. They are naturally able to consider all prudential maxims as below their regard, to treat with contempt those securities and resources which others know themselves obliged to provide, and disdain to accomplish their purposes by established means and common gradations. Precipitation thus incited by the pride of intellectual superiority is very fatal to great designs. The resolution of the combat is seldom equal to the vehemence of the charge. He that meets with an opposition that he did not expect loses his courage. The violence of his first onset is succeeded by a lasting and unconquerable languor; failure makes him fearful of giving way to new hopes, and the contemplation of an attempt in which he has fallen below his own expectations is painful and vexatious. He therefore turns his attention to more pleasing objects and habituates his imagination to other subjects, till, by slow degrees, he quits his first pursuit and suffers some other objects to take possession of his thoughts, in which the same ardor of mind promises him again certain success and which disappointments of the same kind compel him to abandon.

Thus, too much vigor in the beginning of an undertaking often intercepts and prevents the steadiness and perseverance always necessary in the conduct of a complicated scheme like the introduction and extension of the telephone, where many interests are to be connected, many movements to be adjusted, and the joint effort of distinct and independent powers to be directed to a single point.

In all important events which have been suddenly brought to pass, chance has been the agent rather than reason, and therefore, however those who seemed to preside in the transaction may have been celebrated by such as admired or feared them, succeeding times have commonly considered them as fortunate rather than prudent. Every design in which the connection is regularly traced from the first motion to the last must be formed and executed by calm intrepidity, and requires not only courage which danger cannot turn aside, but constancy which fatigues cannot weary and contrivance which impediments cannot exhaust.

The men selected to work out a practical means of utilizing the telephone, possessed not only scientific attainment but also business capacity, the one joined with the other. They perfected the working of the system step by step, boldly meeting and overcoming every obstacle, until to-day they have what may not unreasonably be looked upon as a perfect system; for it answers the purpose for which it was intended, and stands a practical fulfilment of every promise made, the exponent of what intelligence joined to ability and perseverance can accomplish.

Such men as these telephone projectors will seldom be found to work in the dark. The very base of their theory of work is mutual assistance. Too much self-reliance as explained above is the bane of the ordinary scientist and even of many other descriptions of skilled workmen. A serious obstacle in the path of progress in many departments has been the unwillingness of the workmen to compare notes. The physician and the surgeon publish to the world the results of their experiments, and to keep secret important discoveries for purposes of money-getting is looked upon by the members of these fraternities as a species of quackery. Yet there are men engaged in scientific pursuits who are in the habit of concealing discoveries or efficient methods, while the adoption of a broader policy—the free exchange of ideas with their fellow-workmen—would have led to a far greater benefit to both. Recognizing this, the telephone projectors, managers, electricians and skilled workmen sometime since organized what is known as the "National Association of Telephone Exchanges;" being a society in which at regular intervals all those interested in telephonic enterprises may meet and discuss progress made, scientific methods, the utility of various schemes, practical and economical, and future prospects and projects.

The fourth annual convention of this association met last week in Cincinnati, and we venture to say that neither Cincinnati nor any other city in this country ever received within its limits a body of men more creditable to the domain of applied science or more worthy to be identified with American progress in this portion of the second century of the Republic.

The local committee which made the arrangements for the convention was composed of Messrs. George N. Stone, E. V. Cherry, and A. D. Bullock.

Following are the names of the persons present:

A. M. Maconnell, of New York; J. Hutchinson, Philadelphia; W. C. Graves, Rochester, N. Y.; W. D. Lloyd, Boston; E. B. Field, Denver, Col.; Thos. Sherwine, Boston; D. A. Baker, jr., Norwalk; W. G. Baker, Norwalk; George G. Baker, Akron; G. T. Ford, Akron; E. D. Barth, Kansas City; W. H. Helyar, Palmer, Mass.; Harold Remington, Cincinnati; W. N. Easterbrook, Elmira, N. Y.; Chas. A. Rolfe, Utica, N. Y.; C. N. Fay, Secretary of the Association, Chicago; A. R. Woodson, Richmond, Ind.; C. F. Cutler, Boston; Robert B. Munford, Richmond, Ind.; J. H. Arnott, Binghamton, N. Y.; L. Purtscher, Detroit; S. G. Lynch, Chicago; E. M. Barton, Chicago; S. M. Cortright, Allentown, Pa.; M. G. Kellogg, Chicago; Henry Metzger, Pittsburg, Pa.; William A. Childs, N. Y.; A. G. Day, N. Y.; Clark B. Hotchkiss, N. Y.; H. L. Shippey, N. Y.; Theo. Mack, N. Y.; Paul W. Bossart, Kansas City; J. W. White, Fort Wayne, Ind.; E. S. Babcock, jr., Evansville, Ind.; A. J. Carter, St. Louis; George L. Phillips and O. E. Madden, Assistant General Managers; Thos. D. Lockwood, Electrician; R. S. Boyd, C. R. Truex, T. B. Doolittle, Frank B. Knight, J. M. Brown, special agents, Boston; W. H. Eckert, N. Y.; Morris F. Tyler, New Haven; Hon. Henry Howard, Providence; H. L. Storke, N. Y.; Samuel Ivers, New Bedford, Mass.; H. B. Lytle, Boston; H. W. Pope, N. Y.; Geo. C. Maynard, Washington, D. C.; W. D. Sargent, Brooklyn, N. Y.; Wm. Ker, Harrisburg, Pa.; W. H. Cull, Albany, N. Y.; H. W. Spang, Reading, Pa.; J. W. Duxbury, Providence; A. P. Sawyer, Newburyport; George T. Manson, Boston; S. W. Cowles, Buffalo; H. C. Palmer, Buffalo; W. A. Jackson, Detroit, Mich; F. O. Vaille, Denver, Col; H. D. Stanley, Bridgeport, Conn.; T. S. Reed, Bridgeport, Conn.; Henry Bentley, Dr. G. M. Plush, C. M. Root, Philadelphia; R. M. Bailey, Williamsport; J. Chester Wilson, Altoona; Harry C. Haskins, Milwaukee; Angus Hibbard, Milwaukee; C. F. Sise, Montreal; H. C. Baker, Hamilton, Can.; Mr. F. E. Engle, Davenport, Ia.; J. A. Seeley, N. Y.; A. B. Uline, Albany, N. Y.; E. L. Smith, Kansas City; George F. Durant, St. Louis; C. W. Ross, Columbus; W. W. Smith and H. S. Smith, Indianapolis; R. M. Bailey, Williamsport; Col. Geo. L. Beetle, Chicago; John Young, Chicago; W. R. Patterson, Chicago; Ernest Warner, Chicago; E. T. Gilliland, Indianapolis; W. Harrington, Boston; H. A. Cole, Boston; E. V. Cherry, Cincinnati; Isaac Kinsey, Cincinnati; Charles Anderson, Cincinnati; H. A. Briggs, Cincinnati; Mr. Iddings, Washington; J. B. Stabler, Washington; Frank Shaw, New York; Fred. H. Angell, Providence; Eugene Phillips, Providence; J. F. Hedge, Jr., Providence; Theo. Mace, New York; E. Ward Wilkins, Philadelphia.

Shortly before eleven o'clock the first work of the convention was begun. Acting President J. B. Speed, of Louisville, presided, and C. N. Fay, of Chicago, the regularly elected Secretary, sat beside him The latter reported nothing of importance as having happened to the Association during the past year, except the lamented death of the highly esteemed President of the organization, Hon. Marshall Jewell, who died on the 10th of February, 1883. Resolutions expressing great respect for the deceased and deprecating his loss were passed, and a eulogy on the deceased was delivered by Ex-Governor Howard, of Rhode Island, who spoke as an intimate acquaintance and friend.

The Secretary further in his report accounted for the fact that there was no increase in the membership of the association by the fact that there had been many consolidations of former members, thereby decreasing materially the membership, and that the new accessions had no more than made up the losses. He also recommended that the dues of the members be assessed upon some regular basis, and suggested the number of telephones operated by an exchange as the basis of assessment.

Treasurer F. G. Beach submitted a report showing total receipts amounting to $1,721 40: disbursements, $743 67, and cash on hand, $977 73. His showing of such a gratifying and prosperous financial condition was approved.

Following these reports came the election of officers for the ensuing year.

M. James B. Speed was nominated for president but declined, and then moved that Mr. Morris F. Tyler, of New Haven, Conn., be elected unanimously, which was carried. Mr. Tyler responded in appropriate style.

For vice-president, Mr. A. B. Uline, of Albany, nominated W. H. Eckert, of New York, and it was seconded by Colonel A. D. Bullock, of this city. For secretary, Mr. J. B. Speed nominated Mr. C. N. Fay, of Chicago, and he was unanimously elected. For treasurer, Mr. F. G. Beach was elected unanimously.

The following executive committee was chosen: President Morris F. Tyler, ex-officio, and Messrs. W. A. Jackson, of Detroit; H. L. Storke, of New York; Colonel A. D. Bullock, of Cincinnati, and Henry Metzger, of Pittsburg.

As a part of the advisory committee to serve for three years, Mr. H. B. Lytle, of Boston, was elected.

Treasurer F. G. Beach reported as follows: Receipts—Cash received from Treasurer Mitchell, $884 16, from other sources, $837 24, Total receipts, $1,721 40; disbursements, $743 67; cash on hand, $977 73.

President Tyler called the convention to order in the afternoon and announced to the delegates that the officers of the Cincinnati Exchange had invited them to inspect the workings of their office, and also upon application, would be glad to furnish the visitors carriages and guides to the points of interest in and about the city.

It was then decided to accept the resignation of all members consolidated out of existence as if tendered.

The Committee on Legislation, through its Chairman, Mr. Tyler, read a paper stating that little litigation had been brought upon the Exchanges, owing to the fact that the Bell Telephone Company looked so closely after its interests. Telephone companies in many States have been given equal rights with telegraph and railroad companies to condemn property for their use upon the payment of its fair valuation.

Mr. Henry Metzger, of Pittsburg, nominated Mr. Thomas D. Lockwood, electrician of the American Bell Telephone Company for honorary membership. He said: "Before closing the afternoon session, Mr. President, I would like to propose for honorary membership a gentleman who has from the outset labored with us arduously and ably, and whose constant association has, I am sure, benefitted all of us. The gentleman's name is T. D. Lockwood." The motion was put and adopted unanimously and with a vim, and the following named gentlemen were also elected honorary members: O. E. Madden, Esq., Boston, and Col. Geo. L. Beetle, Chicago, Ill.

Mr. Sargent, of Brooklyn, chairman of the committee on exchanges, read a most interesting report on the statistics of the busi-

ness. It embraced reports from nearly all the cities and towns using the telephone, and was replete with information. He grouped the cities into classes, the first being those having more than 250,000 inhabitants, which embraced New York, Brooklyn, Boston, Philadelphia, Baltimore, Cincinnati, St. Louis and Chicago.

The report showed the number of subscribers, number of direct wires, number of circuit wires, number of trunk lines, percentage of subscribers to the total population, average number of calls per day for each subscriber, total number of operators and the number of wires to each operator.

The number of calls per day for each subscriber ranged, he said, from five to eight, except in Cincinnati, where they are eleven. Cincinnati also has a larger number of subscribers in proportion to her population than either of the other cities of the same class.

There are in use now about one hundred and twenty thousand instruments, two in the smallest exchange and 3,576 in the largest. Cincinnati has 2,099, and stands first among the cities of the first-class, with a ratio of one instrument to every 122 persons of its population. The rate per year in Cincinnati is $100, as opposed to $175 in some cities, and $40 in others. Springfield, Mass., a lower city, shows the best ratio, which is one to fifty-four.

A general speaking meeting followed, in which much interesting information was brought out. Electric bells, the different wires, and all the various electrical appliances of telephones were talked about, showing a variety of information and some diversity of opinion. The members were not backward in dissenting from an opinion when it did not coincide with their views.

In consideration of the labor necessary to compile such information as was read by Mr. Sargent the meeting appropriated $150 to be expended by the committee in clerk hire.

At the second day's meeting of the convention, President Tyler introduced Governor Howard, of Rhode Island, who had previously invited the association to meet at Providence. As a powerful argument mentioned the fact that clams were to be had there in September, and without opposition Providence was selected as the place, and the first Tuesday after the first Monday of September named as the day.

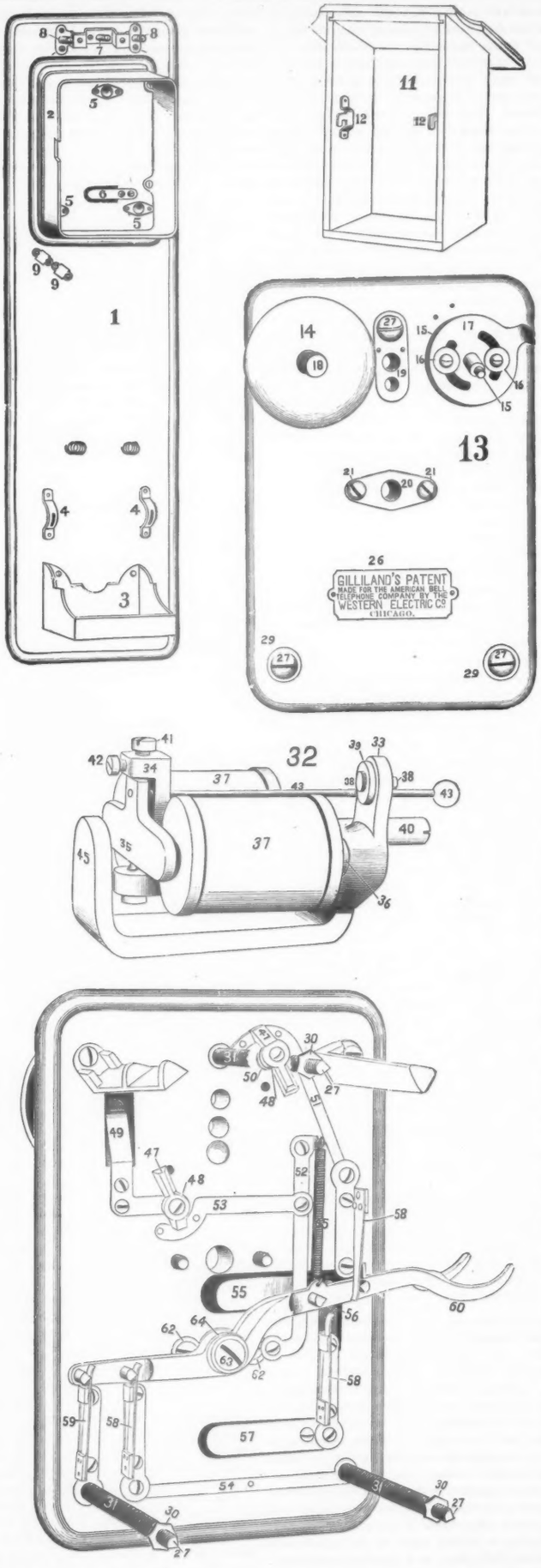
The Committee on Subterranean Cables made a verbal report, followed by a paper prepared and read by the Secretary of the Association, Mr. C. N. Fay, of Chicago, on cables used in telephone service in Chicago, San Francisco, London and Paris, which was taken up and discussed in short speeches by several members.

The Committee on Exchange Rates was called, but had no report to make, and the convention adjourned for lunch.

At 3 P. M. the delegates reassembled, and went into executive session, and remained in private consultation and in the transaction of private business until after 5 o'clock. They reopened the public session only to formally adjourn "the fourth annual convention."

Those who remember the early trials and telephoning, only seven years ago, with its accompanying concerts and practical jokes, would be surprised to know how many of "the boys" of that period are now the heads of electric companies of various titles, with millions of dollars of capital, and to know how many are now rich and prosperous men. The late convention represented in its delegates over $100,000,000 of capital, a thing that seems like a story of Aladdin.

The business done—and it was transacted in a quick and business-like manner, all seeming moved by a common purpose, so far at least as was developed in the public sessions. Many remained to accept the courtesies of the City and Suburban Telegraph Association of Cincinnati. These were tendered through President Bullock, Vice-President and General Manager Stone and Secretary Dickson, in the shape of a drive through the suburbs and a banquet at the Gibson at 4 P. M. It had been the intention of the local committee to give an especially elaborate banquet, but it was abandoned as a bad precedent to set, as the association might meet in towns where the local committee could not afford the expense.



The Western Electric Company took as their guests to Milwaukee a number of the prominent delegates to the Telephone Convention. They left in a Pullman car from the Grand Central depot via the Big Four. The special object of the visit was the inspection of a new switchboard in use in the Milwaukee exchange, and manufactured by the Western Electric Company.

To thoroughly comprehend the progress now being made by the telephone, it is only necessary to compare the report made at this convention with that made only a short time since to the convention assembled at Boston. This showed the total earnings of the Bell Telephone Company for the year 1882 to have been $1,576,031.57, against $1,001,924.91 the previous year. The expenses were $603,-987.29, against $439, 862.76 the year preceding.

Net earnings for 1882, $972,044.28. Balance of income from previous year, $126,-034.58—total, $1,098,078.86. The total of the previous year was $606,555.01. Dividends paid, $595,000; carried to surplus account, $334,997.32; balance of income account $168,081.54—total, $1,098,078.86. The sales of instruments for export have much decreased during the past year, and there is reason to believe that they are likely to still further decrease in the future, as European companies are now manufacturing instruments for themselves; but this is more than compensated for by the already large and greatly increasing demands of the various sections of this country.

Local companies in New York, Chicago, Cincinnati, San Francisco, and Boston are all paying good dividends. All of the Dominion of Canada, exclusive of Newfoundland, is supplied by the American Bell Telephone Company, and dividends are to be expected from Canada. The legal expenses of the company have been very heavy during the past year. A recent report of its treasurer congratulates the company on the fact that the courts have decided that the Dolbear condenser telephone receiver, so-called, infringes on the Bell patent, and an injunction has been issued; also upon the opinion of Justice Gray, that the Bell patent has all the breadth that has been claimed for it, and covers microphones and instruments that employ electrical undulations.

The People's Telephone Company, using a carbon transmitter, set up lines in New Jersey, and, the report says, that an action on the case called forth the most careful examination that has ever been given to the principles of the various instruments, and gives additional proof that the microphone and other things claimed under the Bell patent are authorized. The case has since been decided in favor of the Bell company.

As we explained, or rather inferred, at the beginning of this article, the public, though have neither the time nor the inclination to look into scientific problems, is quick to understand them when lucidly explained. This being the case, it would seem to be the duty of the daily press to undeceive the public in the matter of long distance telephony applied to practical work, a subject which seems to be very generally misunderstand. Despite the fact that recent experiments have demonstrated the possibility of telephoning over long circuits, it is to be doubted if the instrument will be used otherwise than locally. It is too sensitive to induction, to atmospheric electricity and to grounds for circuits exceeding a few miles in length. The experiments have been tried under the best, not under the worst conditions, and through a complete metallic circuit—in other words a double line. It is hardly possible, as a portion of the public would seem to imagine, for the telegraph business of two large cities to be conducted by telephone by the senders of messages themselves, for five hundred wires, nay, nor a thousand might not suffice to prevent a block in busy hours.

The power of the telephone to transmit the voice to long distances is intimately associated with its delicacy. Mr. Willoughby Smith has found by experiment that a telephone will work through a resistance of wire corresponding to 150,000 miles of telegraph line; and hence it would seem mere child's play to fulfil the words of the poet, and "Waft a sigh from Indies to the Pole." But this was only a laboratory experiment; for on actual telegraph lines the leakage of electricity from the wire to the ground, damp, and other drawbacks, render the

transmission of speech by wire far less easy in practice than was at first supposed.

As interesting experiments having little practical value in our opinion, speech has been transmitted in this country over a wire more than one thousand miles long; and conversation has been carried on in India over 500 miles; 390 miles from Tabriz, in Persia, to Tiflis, and 300 miles in Spain, Australia and other places where the atmosphere is dry and pure. In England they have never had much success with long lines owing to the humidity of the atmosphere, but Mr. Van Rysselberghe, the ingenious chief of the meteorological observatory at Brussels, has telephoned from that city to Paris, a distance of 215 miles, and this while the same wire was carrying simultaneously an ordinary Morse telegraphic message. By a peculiar disposition of his apparatus, Mr. Van Rysselberghe spoke to Paris by telephone without any interference from the Morse signals that were traversing the identical wire at the same time. The day after the bombardment of Alexandria, it was announced in the London papers that the noise of the guns had been heard at Malta by telephone through 1,000 miles of submarine cable. Experienced electricians took the statement with a grain of salt because they knew that a submarine cable differs from a land telegraph wire in the greater retarding effect which it has on electric currents traveling along it. A cable has the effect of running together—jumbling up—the delicate and rapidly succeeding vocal currents of the telephone, and either muffling the articulation or creating absolute silence.

But the telephone has a separate and distinct work to perform apart from the telegraph; it has a field of its own of so large an extent that there is no occasion whatever for trending upon the work of the telegraph and the submarine cable. To this field alone the intelligent men who control its fortunes may be relied upon to confine it.

THE EXHIBITS.

The Display of the Manufacturers of Electrical Instruments and Apparatus.

THE WESTERN ELECTRIC COMPANY—MULTIPLE SWITCHBOARD—SPRING-JACKS AND THEIR CONNECTIONS—CABLING SYSTEM—THE "PATTERSON" CABLES—ÆRIAL, SUBTERRANEAN AND SUBMARINE—LOW INDUCTIVE CAPACITY—HIGH INSULATION—STANDARD SWITCHBOARDS—WILLIAMS' SWITCHBOARDS—THE TOLL-STATION SWITCHBOARD—THE NEW GILLILAND MAGNETO-BELL—LIGHTNING ARRESTERS.

MULTIPLE SWITCHBOARD.

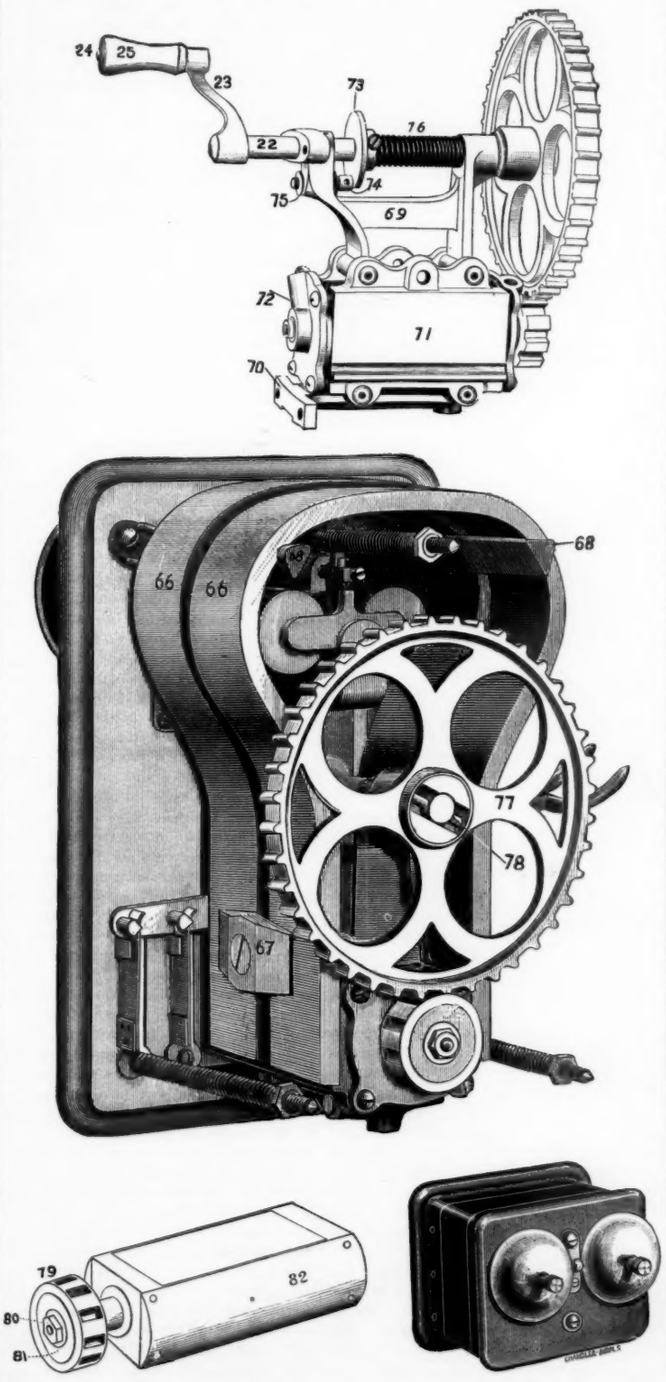
One of the most interesting exhibits of electrical apparatus made in Cincinnati during the sitting of the telephone convention was the multiple switchboard for telephone exchanges, made by the Western Electric Company.

Not long since, as the readers of the REVIEW will remember, we illustrated this switchboard, and gave a detailed description of its practical working. We will, therefore, now content ourselves with a description of the spring-jacks and their connections, which form a most important adjunct to the same, and are manufactured by the same company.

Though to all appearance the same spring-jack which has for some years been in use in connection with the multiple switchboard, it possesses in its present condition a very important improvement. This consists in an insulation established between the frame of the jack and the spring which forms the usual line connection.

This insulation, say its manufacturers, becomes necessary in the multiple system to provide for the test which enables the operator to determine whether the line is in use.

The frame of the jack is inserted at the back of the board and screwed fast by a lug which forms a portion of the frame. The phosphor-bronze spring and the contact point on which it normally rests are insulated from the frame of the jack by hard rubber bushings and plates. The connections of the jacks are all made at the back of the board, and, to facilitate this work, phosphor-bronze connecting pieces are exeended from both the insulated contact point and spring, bringing all the connecting points together in one plane surface. When a plug is inserted into the jack, the phosphor-bronze spring is lifted from the insulated contact point, breaking a connection therefrom, and a new connection



is established to the tip of the inserted plug, upon which the spring now rests, and thence to the cord connecting with the plug. A connection or cross is also established between the phosphor-bronze spring and the frame of the jack, through the medium of the plug. It is this cross as thus established which provides for the operator's test. Referring to circuits it will be seen that the three spring-jacks of a line placed respectively on three multiple switchboards. The circuit through these three jacks and the annunciator is from the subscriber's line through the lightning arrester to the spring of the first jack, from must be included in the circuit between the last spring-jack and the ground.

This new combination circuit system has not been shown before, and in a subsequent edition we shall go into it more thoroughly and illustrate, with the *permission* of this manufacturing company, its prominent exhibits in detail, as well as those of the other principal exhibitors.

THE PATTERSON CABLES.

There is little doubt that in the near future every wire that can be efficiently worked underground must be lowered from the poles, and consequently everybody in the electrical business, whether in the telegraph, telephone or lighting field—we say everybody is looking for a means of judiciously sinking the wires.

The Western Electric Company would seem, therefore, to be just in the nick of time with the "Patterson" cables. These cables attract much attention wherever exhibited, because it has been demonstrated that they are conducted upon a correct interpretation of natural laws, and possess characteristics which make them a practical success, whether their use is ærial, subterranean or submarine. This cable consists of a group of conductors, each covered with two or more windings of cotton or jute, or both, saturated with paraffine and protected by a lead pipe. The space between the group of conductors (or core), and the pipe is filled with ærated paraffine. The core may be made in continuous lengths of 1,500 feet, and the protecting pipe is jointed over it in lengths of 75 to 100 feet. Any flaw which may exist in the pipe and any leaky joint is detected by the process of filling. The almost invisible globules of gas, scattered uniformly through the mass of the paraffine filling, render it elastic, so that the natural shrinkage of the paraffine in cooling is compensated for in the expansion of these globules, presenting the formation of cracks and longitudinal fissures, through which water would penetrate indefinitely in case of a break in the protecting pipe.

Another and not less important function of gas is to reduce the specific inductive capacity of the insulator. Solid paraffine possesses about the lowest static capacity of any insulator, except air and gases; an admixture of dry gas in the above described manner reduces the specific inductive capacity at least 15 per cent. below that of pure solid paraffine. The practical utility of this extremely low inductive capacity is that it permits of the use of a conductor of 200 ohms per mile resistance, and results in a cable in which the effects of retardation are no greater than in a conductor of 200 ohms per mile, insulated to a proportionate thickness with rubber or gutta percha, and provided with inductive shields. The weight of the conductors being equal, and the thickness of insulation the same, if a gutta percha or rubber insulated cable works for a distance of two miles, this, it would seem, might be depended upon for equally good service through three smiles. This use of small conductors is, for cables of moderate length, an advantage, in that the diminished surface prevents to a great extent any trouble from "cross talk," due to the static charge or condenser of the wires; and besides economizing space, the proximity of the wires to each other causes the circle of other conductors surrounding each one to act as an air induction shield. In case of a lightning discharge, if the cable is not protected by an arrester, the small size of the wires and thinness of the covering causes them to burn off close to the end of the pipe, causing less trouble to repair than if the wires had been of sufficient conductivity to allow the charge to pass through them and jump to the ground at some point of thin or defective insulation anywhere inside the cable.

THE NEW GILLILAND BELL.

The names and numbers of the parts of the Gilliland bell, together with the prices for single parts, will be found in the catalogue published by the Western Electric Company, which is extensive. We are unable to quote it in this connection, for want of space, but will do so in a subsequent edition.

A black-walnut base-board supports, as usual, the bell-box and battery stand.

The bell-box is made of iron, and is tastefully japanned, and screwed permanently upon the base.

The works, both of the generator and ringer are affixed to the front of the box, which is made of mahogany.

The generating magnets are of extra large size and consequently very powerful, and the armature cylinder which consists of cast-iron pole pieces, united by brass castings, of course, is fixed between the poles.

The front part carrying the works of the bell is attached to the base by three screws

which are maintained in position by spiral brass springs surrounding them. These screws serve also as electrical connections for the wires. The ringer is held in posi ion by small clamps, and these serve also for electrical connections. All ringers are detachable, so that if a ringer cannot be conveniently adjusted when the bell is fixed up in an office, it may be taken out altogether, and a second one substituted for it.

In order to take it out, the front must be removed from the bell-box; it is then necessary to remove the large wheel; this is done by pressing the shaft inwardly, and forcing the fastening pin through the groove in the hub. The clamp screws must then be slightly loosened and turned on one side, and the ringer can then be withdrawn.

A screw extends through the cover, by which the ringer can be adjusted without opening the box.

The apparatus for rotating the armature consists in a crank-shaft, a soft metal spur-wheel and a rubber pinion, the latter being on the armature axis. The spur-wheel is loosely fitted on the crank-shaft, and by a

pin fitting in a groove on the hub, the rotation of the shaft impels the wheel.

Like all magneto bells, there is attached to this an automatic switch, which operates to introduce the telephone into the line circuit, and also to close the local circuit of the transmitter battery; when not in use, the telephone rests in the yoke on the end of this switch-bar, and by its weight depresses the same, cutting the telephone out.

The arrangement for breaking the shunt circuit of the generator is automatic, and very reliable; steel is substituted wherever practicable for iron, and every precaution seems to be taken in order to make first-class and endurable telephone bell. It is obvious that at the present time, it would be imprudent to say anything regarding the durability of the bell since in telephone apparatus, as in most affairs, the proof of the pudding is the eating thereof. And with such formidable competitors in that line as the Williams and Post, and Davis and Watts bells, it will no doubt be put on its metal.

So far as the generating and ringing powers of the bell are concerned, there need be no hesitation in saying that they are superlatively good. The generator is one of tremendous power, and the ringer wonderfully sensitive. And if the bell proves retentive of these qualities, there is very little more to be desired.

The battery box arrangement is one of the specialties, and consists of a cast-iron flanged shelf, on which the battery jar is to be placed; this is covered by an ornamental veneered box, which has a couple of hooks engaging in slotted springs fastened on the base-board.

The battery box, or cover, can be removed by gently rapping the box, moving it upward and detaching the hooks from the slotted springs, which are adjustable, and can be tightened or loosened if necessary.

The line is connected at screw-posts at the top of the bell, and when used at a terminal station the line is to be attached to the left-hand binding post, and the ground wire to both the center and right-hand binding posts, but if used at an intermediate station, the in and out line wires must be attached to the two side screws, and the ground wire to the center screw.

The transmitter wires are all arranged for connection with the transmitter, which is placed immediately over the battery box; and instead of binding screw terminals for the telephones, binding clamps are provided, which seem admirably adapted to prevent the cord tags from working loose.

The bell is emphatically a fine piece of workmanship, and only needs the test of use.

THE KERITE INSULATED WIRE AND CABLES,

made by Mr. A. G. Day, at Seymour, Conn., commanded more than ordinary attention for their fine finish and excellence of construction. These conductors were exhibited in the various sizes and styles made by this house, from single insulated wire up to cables of sixty conductors for telephone and telegraph purposes. There were eight styles of armored cables, containing from one to seven wires, and one of ten. The business manager, Mr. Clark B. Hotchkiss, represented the house and took charge of the exhibit, while Mr. A. G. Day, the inventor, as a visitor, enjoyed himself investigating the many electrical appliances of experimenters and inventors in other branches of electricity.

THE LAW SYSTEM

received marked attention from the representatives of the telephone companies, and the workings of the system was interestingly explained by Mr. Frank Shaw, the competent and well-known electrician of the company. The Law telephone system is in use in the southeastern territory of the United States, and at other points, and gives satisfaction in these localities. It is one of the oldest exchange systems, and the apparatus on exhibition was very elegant in design and finish. Mr. W. A. Childs, president of the company, was also present, looking over the field and watching the interests of the company which he represents.

Mr. W. H. Helyar was there taking care of the interests of a young but important manufacturing company, whose extensive works are located in Southern Massachusetts.

THE PALMER WIRE COMPANY

have never been seen at one of these exhibitions before, and although their exhibit was not located in a favorable position, their samples embraced all that could be desired in telephone and telegraph wire. This company have recently gone into the manufacture of galvanized iron, Bessemer and steel wire of every description for electrical purposes and has made marked progress since the beginning. The goods of their manufacture is drawn with great care and exactness from the best iron and steel, and by a continuous process of annealing and galvanizing, secure a very even and tough wire, as the samples prove.

The enterprise and business ability of this young house might be followed with good results by older concerns who rely upon the reputation of their ancestors rather than upon the excellence of their production or the care with which they attend to the wants of their patrons.

THE ELECTRICAL SUPPLY COMPANY

was represented by Mr. Theo. Mace, their New York manager, who placed before the experts samples of electrical apparatus which they manufacture or for which they hold the agency, among which we found an automatic cut-out for electric arc lamps. This cut-out has advantages not seen in others and is valuable in case the lamps should fall or a derangement occur requiring attention while a number of lights are burning on the same line. By means of a spring the lamp is cut out of circuit when its weight is taken off.

Beside their unusually full list of annunciators, vibrating bells, burglar alarms and insulators, they had an interesting exhibit of telephone, telegraph and electric light wire for every position and purpose for which they are used, also a new battery, known as "the diamond carbon telephone battery." In size it is six inches high, four inches square, and fits any telephone box. This battery has a very great carbon surface, its internal resistance being only $\frac{1}{10}$ of an ohm, and the carbon connector is re-inforced by platinum wire and lead, making an absolute connection. The elements are simple, and can be replaced at small cost, making a desirable battery for telephone purposes.

THE STABLER INDIVIDUAL CALL

attracted considerable attention. The exhibit was in the same room with that of the Standard Electrical Works, who make the instruments for Mr. Stabler. Some improvements have been made in this apparatus since it was shown at last year's convention in Boston, a notable one being in the generator used. There are other improvements in the mechanism and character of this system, but our space will not allow of a more extended notice at this time. Mr. Stabler was assisted by Mr. J. H. Iddings, whose geniality and thorough knowledge of electrical science as applied to the Stabler call system made his explanations interesting to those well versed in telephony and also to the outside world.

THE AMERICAN ELECTRICAL WORKS,

of Providence, R. I., had an extensive exhibit, completely covering the whole field of electric conductors.

The electric light wire manufactured by this company consists of the various styles in general use for outside, inside, underground, and submarine conductors. The best Lake Superior copper wire is used and thoroughly insulated, with an outer covering of fire and waterproof materials. Their exhibit included almost every style of conductor which can be used in this connection for either arc or incandescent lighting. These works have long been noted for their specialty in telephone and telegraph, office and annunciator wire of all descriptions including all kinds of electric cordage. Their exhibit in this department approached the wonderful. Starting with twenty different styles of magnet wire, from forty to fifty of office and annunciator wire of all sizes and varieties of color, and as many more for telephone and telegraph purposes. Notable among the latter was a flexible connecting cord for the telephone, with double worsted covering, and tinsel conductors having their patent solid-screw tips. A novelty in this line was a cord for attaching the telephone to circuit, fitted with Sawyer's patent rubber supporter, which removes the strain from the tips and renders the cords more durable. Another specialty manufactured by this company is an insulated telegraph and telephone wire, double braided with cotton and saturated with their patent compound. These are made from the best galvanized iron wire, in sizes from No. 8 to No. 16, making an excellent line wire. Of the three styles of cables exhibited, the "Lytle cable" is the superior to the others. It is made from the best materials. Cables of from 10 to 100 conductors, each conductor thoroughly insulated with rubber (800 megohms per mile), and covered with tinfoil. the whole twisted together and covered with a braid, a perfect rubber tube, and a weave of heavy linen, similar to fire hose, and then thoroughly saturated with paint and varnish, securing high insulation, combined with the best possible protection from the weather and mechanical injury. Another style, known as the "group cable," sixteen hundred feet of which was exhibited in the vestibule of the hotel, and attracted wide attention. This cable is composed of rubber-covered wires, and made in groups of 7, 8, or 9 conductors, the center one of which is covered with tinfoil. The groups are then twisted together and covered with a perfect rubber tube, and finished similar to the one mentioned; it is then saturated with paint and varnish, making a durable insulated cable. The third cable is composed of cotton-covered wires, saturated with their patent compound, and made in groups of 5, 6, or 7 conductors, and finished up like the others. Mr. Eugene F. Phillips is president of the American Electrical Works, and it is to his thorough knowledge of the requirements of the age, and the able assistance of Mr. W. H. Sawyer, secretary and electrician of the company, that so much has been done to improve and advance this important branch of electrical science.

Mr. F. H. Angell, purchasing agent for the company, had charge of the exhibit, and constantly watched the large interest placed in his hands with fidelity.

THE PROVIDENCE TELEPHONE AND ELECTRIC COMPANY.

It would be superfluous for us to mention the work already done by Mr. J. W. Duxbury, in placing the telephone exchange at Providence, R. I., among the leading ones of this country and the world. Some of the elements which have contributed to the success of this model exchange can be briefly mentioned now, and if the curious desire to investigate further we would refer them to past history, published at various times in our columns. Their success in a great measure has been due to the mechanical appliances used, samples of which the company exhibited at the convention. The Providence switchboard, in use in the large exchanges in the East, and exclusively in the Providence central office, where there are over eighteen hundred subscribers' lines in one room, admits of expansion to accommodate at least three thousand subscribers' lines in one room, and brings all the working parts within reach of the operator without stretching. All the connecting wires and points being encased in rubber, leakage and induction is therefore reduced to a minimum. It has been found by experience to do quick and economical work in a large central office, and can be used advantageously for metallic circuits. The Worcester office has been equipped with this board, and switches for Springfield office are now in operation.

There were four of these boards on exhibition, showing the different sizes and styles made by the company, and all equipped with the Breckenridge jack, a device for looping in the central office telephone, without breaking circuit or in any way interfering with the free conversation of subscribers who may be using the line. The central telephone office in Providence has used this device in preference to all others. Two years' experience has proved its reliability and adaptation to the wants in this respect of a large telephone exchange. It is in use in some fifteen or twenty exchanges in the country, and is highly recommended.

The Howard Safety Appliance is the invention of Mr. Charles T. Howard, Secretary of the company, and is a valuable lightning arrester. This device consists of a cut out and fusible wire in a compact form, to be placed outside of the house or place of business of the subscriber; the electric current, by means of an arm extending inside of the building, being entirely cut off from the interior at the will of the subscriber, while fusible wires afford additional protection when the instrument is in circuit, should an excessive charge, as from electric light currents, be accidentally thrown upon the telephone line. The advantages of this device are too obvious to need further comment. It is in successful use in Providence and other exchanges, and is in increasing demand wherever it has been introduced.

In addition to the apparatus mentioned, the company have a clip for hanging cables, which fully meets the wants of telephone and telegraph in this respect, and New England rights for the best system of electric time.

The circulars issued were elegantly designed, and the by far the best examples of printers' skill to be seen.

Mr. J. F. Hedge, jr., superintendent of the electrical department of the company, had charge of the exhibit and proved to be an intelligent and interesting expounder of the mechanism under his care.

UTICA ELECTRICAL WORKS

displayed a large assortment of attractive samples for fire and burglar alarms, bells, and gas lighting apparatus. Their new an-

nunciator, differing from many of the old styles of drops, is unique and serviceable for hotels or for private residences, and has advantages over other apparatus of this character. It is quick to respond to the call, easy in movement and its simple construction make it durable and not easily put out of order. The exhibit included Palmer's universal telephone switchboard, with the inventor's patent spring jack connections. This device is well known in telephone circles and requires no introduction to our readers, and is in use in the cities of Albany, Troy, Utica, Herkimer, Amsterdam, New York; Cleveland, Ohio; Galveston and Houston, Texas; Little Rock, Arkansas, and other prominent places in the United States, Mexico, and Central America. Mr. Charles A. Rolfe is the general agent for this company.

THE STANDARD ELECTRICAL WORKS

of Cincinnati, gave an exceedingly fine display of magneto bells. There was nothing wanted in this regard. Every type of these instruments were liberally shown, and commanded close attention for their finely finished working parts and graceful and elegant exterior. Besides the ordinary bell, a large number of which was shown, we noticed a new design, which they are now making for extra territorial and long lines. It is a very strong, compact magneto bell, with fine cut geared wheels, and is guaranteed to ring through not less than 20,000 ohms resistance, fully double the strength of their "Standard" No. 1. In all other respects this instrument is the same, only a little larger than the present bell.

The company also exhibited an improved club switchboard, which was shown complete, with magneto bell, transmitter and telephone as set up ready to attach main lines to the binding posts on top of board. This board is used largely in small villages, branch exchanges and for club purposes. It is very neat—made of black-walnut and highly ornamented. Also a small power generator for general exchange use. One generator this size will run twelve to twenty tables, having strength and capacity equal to eight small switchboard generators. The brushes on the armature are so arranged that they can be easily adjusted when worn. The bearings on the armature are made of fine steel, and will stand hard and constant service.

Their improved switchboard for general exchange purpose, received more than ordinary attention, and the many good points of their board impressed the managers favorably. Mr. Isaac Kinsey, secretary of the company, managed the exhibit with unusual ability.

LYNCH AND BANTA, OF CHICAGO,

exhibited two sections of the asphaltum concrete conduit, manufactured under the Dorsett, Morris and Williams' patents. This new and improved design for conduits excited much interest. The material used in its construction seems too impervious to moisture and its insulatory qualities are excellent. We shall in a subsequent edition give fuller description of this system. At present we append herewith the opinion of two unprejudiced electricians:

CHICAGO, April 25, 1883.

D. H. DORSETT, Esq.

Dear Sir: I have made the following tests of the ashphalt-concrete material submitted to me by you for that purpose. A piece of the material 8 in. square and 1½ in. thick was kept saturated on each side with acidulated water for three and one-half hours and then placed in electric connection with a battery of 330 callaud elements and a delicate galvanometer for a period of thirty minutes, and its insulating properties under these conditions were perfect, there being not the smallest signs of leakage. Several other similar and very severe tests were made upon pieces varying from one-fourth of an inch to two inches in thickness, all of which proved the material to be an excellent insulating substance. I also made a thorough test of three lengths, joined, of your underground electrical wire conduit, manufactured from the same material noted in above tests, using a very delicate reflecting galvanometer and sixty elements (chloride silver). This test showed the form of conduit to be perfect in its non-conductive properties. In my experience during the past three years I have examined numerous devices for protecting and insulating electrical wires underground, and I have certainly never seen a material, tests of which answered all the necessary requirements so successfully as yours. In my opinion your form of conduit is perfection.

Very respectfully,

L. O. MCPHERSON,
Western Electrician, Mutual Union Tel. Co.

OFFICE WESTERN ELECTRIC CO., }
CHICAGO, Oct. 4, 1883. }

Mr. D. H. DORSETT.

Dear Sir: I have tested the sections of conduit furnished by you by immersing them in water and filling the holes with water, and measuring the insulation between the holes and the water outside. The result obtained at the first test was about 9,000 megohms for the length of twenty-six inches. No change was observed after thirty-six hours' soaking in the water, and at the end of a week the material appeared to be perfectly impervious to water. The first test and the second, at the end of thirty-six hours, were made upon a section of conduit containing a joint and a closed end—practically two joints. Upon breaking up one of the sections, the structure or the material appeared to be perfectly homogeneous and of uniform density and hardness.

Yours respectfully,

W. R. PATTERSON.

THE DOMESTIC ELECTRICAL MANUFACTURING COMPANY

exhibited three samples of their specialties, all of which are electrical novelties and attracted wide attention. Their character and construction are such that most, if not all, telephone men in this country would be interested in seeing succeed and in developing a field for.

One of these specialties, an ingenious device for lighting gas, will undoubtedly supply the place of the old dirty and cumbrous torch and wicks now used for igniting gas. The field is not alone limited to the wider scope of supplying hotels and large places of business, but will fill a conspicuous place in the household, where cleanliness is desired; and to those who would reduce the risk of fire from the carelessness of servants and the too ready match.

The sample shown was about two and a half feet long, the handle extending half its length, which contained two cells of battery. A hollow tube extended from the handle to any desirable length, through which the connecting wire of the battery are carried to a point at the top, the ends remaining slightly apart. By means of a trigger in the handle connections are made which drives a spark from the wire ends at the top. The capacity of this ingenious piece of mechanism is very close, if not fully up to 4,000 sparks, and so small are its parts made that no possible fault can be found with it in any particular. Another novelty was a physician's portable battery, which could be put in the vest pocket without trouble, and is the neatest thing of this class that has come to our notice. Both of these devices can be readily taken apart and the batteries recharged at very little expense. The company are also making a small annunciator bell that can be used for household purposes.

Mr. A. P. Sawyer, president of the company, is one of the early telephone men, and has taken hold of this enterprise to develop interest and supply the demand for electrical specialties of every description.

General Agent Geo. L. Beetle, Samuel Ivers of New Bedford, and Geo. T. Manson of Boston made a short visit here on their return from the National Telephone Convention.

A Suburban Drive and a Notable Banquet Complete the Festivities.

At the invitation of President A. D. Bullock, Vice-President and General Manager Captain George N. Stone, and Secretary Dickson, on behalf of the City and Suburban Telegraph Association of Cincinnati, the remaining members of the National Association of Telephone Exchanges, in convention there, enjoyed a drive and banquet of more than ordinary interest on Thursday. Assembling at the Gibson House at 10 A. M., the party were driven in Zumstein's carriages, headed by Captain Stone in his open driving wagon, with three prominent guests, through Burnet Woods and glorious Clifton, to Chester Park, where Maud S., the only living thing that is quicker than the telephone, received in her capacity as "Queen of the Turf" the kings of the telephone. To the ladies accompanying the latter she was especially gracious, accepting sugar from their gloved fingers with as much zest as if she liked it and was not merely paying them the courtesy due them as callers. She was jogged around the course by Mr. Bair for the edification of the strangers, whose motto, like her own, is "Go ahead," and who lose no time in superfluous action.

From the course, after a glass of cold *See*, the party were driven over the more beautiful portions of the hill land, and anchored at the Gibson at 3 P. M., the hour set for the banquet, which, ordered but twelve hours before, had been gotten up by mine hosts of that hotel, with especial reference to the abilities of Mr. Al. Corre, grown skillful with practice on the Mercantile Club, to do the correct thing on short notice. How well he succeeded may be imagined, but by those not present can scarcely be realized on perusing the following *menu*, which was set forth on exquisitely illuminated cards, backed up by a dainty reproduction in colors of a famous picture.

Dinner in honor of the National Telephone Exchange Association, given by the City and Suburban Telegraph Association of Cincinnati, Gibson House, October 16, 1883:

"Hello."

Haut Sauterne.]
Blue Point Oysters.
"Closer to the microphone."
Puree of Chicken.
"Are you waiting?"
Baked English Turbot.
Hollandaise Potatoes. Dressed Celery.
"Here's your party."
Haut Lafitte.]
Fillet of Beef, Mushrooms, Dutchess Potatoes.
"Don't cut me off."
Miranda Punch.
"Their line is crossed."
Pommery Sec.]
Roast Larded Grouse. Julienne Potatoes.
"Stand back a little."
Ice-cream. Cake.
"How do you get me?"
Fruit.
"The line is in use."
Brie. Rochefort.
"Call again."
Coffee.
"Good-by."

The dinner, admirably prepared, was enjoyed in silence, save for the converse of neighbor with neighbor, and an occasional "across-the-table" sally, but the speeches which followed the introduction of champagne, "the wine of courtesy," took all the more importance from their informal nature. President A. D. Bullock was first called up in a graceful little speech by Chairman Stone. He was happy beyond even his usual readiness, and finally, expressing his confidence in the success of the Bell telephone patent, said, amid cheers and laughter, that if it failed the funeral would be the greatest on record. Mr. H. N. Gifford, of the Louisville exchange, was next brought to his feet, and his neat speech was followed by cries for T. D. Lockwood, the electrician of the Bell Telephone Company, who, like the foregoing, delivered one of those happy *post prandial* speeches, sparkling with subtle wit and losing so much in reproduction in cold type. Mr. W. H. Eckert, the New York manager, received with cheers, was in equally brief, but happy mood, and Mr. C. N. Fay, of Chicago, the next speaker, was likewise applauded and laughed with. Capt. Geo. N. Stone was next clamored for, and delivered a little oration apart from those frequently called for, by his position as toast master, and with equal happiness. Mr. Sise, of Canada, begged off, and more than repaid the audience for excusing him with a funny story of telephone experience. E. V. Cherry, of Post & Co., came next, and was brief and pointed. Mr. Childs, of New York, Mr. Metzger, of Pittsburg, Mr. Sherwin, of Boston, Prof. Shiras, of Cincinnati, and Mr. Fred. O. Vaille, of Denver, and Mr. Bailey followed in the spirit of the moment—brief, pointed, and witty. At this period one of the most impressive scenes of the day occurred.

A member of the press, called upon to respond for "The Third Estate," did so, and, in closing, asked for E. T. Gilliland, who, he said, had done more, in his line, for the Bell telephone, than any man except Bell.

This called to his feet Mr. T. D. Lockwood, the electrician of the Bell company, who warmly and eloquently seconded the sentiment, and proposed the health of E. T. Gilliland, "the man who, in practical appliances and their development, had done more for the company than any man living except Mr. Bell himself."

The health was drank standing, as proposed, and Mr. Gilliland said, after thanks: "I cannot make a speech, but if any of you want a magneto bell tinkered up [cheers and a voice, "Or one invented"], I shall be glad to have you call on me." [Applause.]

After a vote of thanks to the Gibson, the meeting broke up.

The Telephone Business in South America.

It is not surprising that the success which has attended the introduction of the telephone in the United States should have at last found its way to South America, where after watching it here for two or three years, the large business communities have taken hold of it with an avidity which has developed some telephone exchanges which rival any at the North.

At Rio de Janeiro, the Telegraphos Urbanos Company has over 650 actual paying subscribers in connection, and is running lines to connect the suburban places with the city.

At Buenos Ayres, the United Telephone Company of the River Plate, Limited, has over 1,100 subscribers connected, and a telegraph business by means of the Bell telephone, is being done between Rosario, Santa Fe, and Cordova and Buenos Ayres, besides exchanges in each place. At Caracas, Venezuela, an exchange of 130 subscribers has been put in operation since June 1, and at La Guayra, the seaport town of the capital, twenty-five subscribers enjoy the same privilege, with the promise of having a four wire telephone trunk line to connect the two cities so soon as the wires can be strung.

This is a feature in the capabilities of the telephone which has not been possible in the United States, owing to the restriction clause in the American Bell Company's contract with the Western Union Company, but the Tropical American Telephone Company, which supplies all the Bell telephones to South America, Central America, West Indies and Mexico, is not restricted in this respect, and consequently can use the telephone for a telegraph business, and it is one of the most profitable branches of the whole system.

Exchanges are being started at Bahia, Pernambuco, Santos and Rio Grande, in Brazil, and on the west coast, Santiago, Valparaiso, Lima and Bogota, will soon be added to the list of cities enjoying telephone central office communication. In the West Indies, Barbadoes and Trinidad already have ninety and seventy subscribers, respectively.

Very truly, JAS. H. HOWARD.

General Superintendent Keller has just returned from California, and is spending a few days with his friends in New York and New England.

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The Telephone Convention and the Telephone Field.

Elsewhere, in this number of the REVIEW, will be found a full account of the Cincinnati Convention, the men who were there, and the field in which they labor together, with a few comments upon the present condition of telegraphic work, and what may be looked for in the future. Following this will be found a description of the exhibits.

The brains of one of the largest corporations of this country, indeed of the world, were gathered last week in Cincinnati. These men represent a capital of one hundred millions of dollars, and companies which, while carrying on the most stupendous enterprises, was never known to make a mistake, never known to rush into projects of doubtful promise, and never known where boldness was called for to exhibit timidity or indecision.

The men who control it, the men who gathered at Cincinnati, may safely be taken as true exponents of American perseverance, intelligence, and enterprise. These men, when they had fully digested their project of introducing the telephone into every-day affairs took great strides, while the capitalists of the Old World crawled hesitatingly and tremblingly along.

A striking contrast was presented in the quiet and orderly demeanor of these men while meeting in convention, to some other conventions which we have seen in which they who had the least to say bawled the loudest; where effrontery only succeeded in finding an audience, and where garrulity was mistaken for intelligence and impertinence for wit.

The object to promote which they were assembled was never lost sight of, and when it was attained, an adjournment immediately followed.

These men took the telephone when scarcely more than an ingenious toy, and made it almost indispensable to the business community. But there were days of anxiety and trial in this telephone field. The rose-water hue which now it wears is but a recently acquired tinge. Once there were so many obstacles in the way of commercial success, that men of less grit and energy would have quailed at the prospect. That part of their work on which they expected dissatisfaction most frequently to fasten was the central office, in which they could not hope to satisfy those who were, perhaps, not inclined to be pleased since they were not always able to satisfy themselves.

But now, what with improvements in apparatus and thorough system in the central office, telephone lines work smoothly, and waits, mishaps and mistakes are reduced to a minimum

The telephone field, and he who labors within it, are of especial interest to THE ELECTRICAL REVIEW, which has ever devoted itself to all that most nearly concerns both the one and the other.

We have a personal acquaintance with most of the organizers and projectors of telephone enterprises. To these no assurance of good will is necessary. To those who have recently entered the field, or are about to do so, we would say that THE ELECTRICAL REVIEW will always be found ready to listen to their complaints or suggestions, and to lend them a helping hand; and, being the only journal in the country representing telephone interests, it may safely be said to be in a position to act effectively.

New Cables.

The project of laying two additional cables by a new company, which some time since we brought before our readers, is now about to be realized. The cables are in course of construction by the Siemens Brothers, and the arrangements for laying and testing them are now under advisement.

We said before, and we repeat now, that we do not see what want the laying of these additional cables is likely to meet, and we shall be surprised if the project results in anything more than a forced reduction in the price of messages and the falling off in the efficiency of the service, which such a course usually leads to.

It has been alleged that cable messages, under the present system, are not suffered to pass without inspection by interested and unscrupulous persons; that on this side of the water one of these persons is Jay Gould, who, by withholding a dispatch or changing it, may jeopardize the interests of those who use the cables; and finally, that news coming through such hands, or passing the inspection of such persons, cannot be relied upon.

Now, if such was the case, we should at once declare ourselves in favor of a new cable, or a dozen new cables. But, as a matter of fact, there is absolutely no evidence on record to sustain these assertions; no evidence to prove that under the present system messages have even been needlessly retarded or tampered with. We cannot, therefore, see how the public interests can in any way be benefited by the laying of new cables.

Are Official Reports of Any Value?

The recent experiments at Grenoble, France, in the transmission of electrical energy, if not wholly satisfactory from a commercial point of view, would seem, from what is now transpiring, to possess no little value from a psychological. This result, though unlooked for, is none the less gratifying and will, doubtless, amply repay M. Deprez for his labors, and the committee of inspection for its perseverance.

No sooner were the results, as found by the latter, made public than the minds of the critics exhibited various abnormal symtoms. These systoms we are now seeing reflected in the various scientific publications on this and especially on the other side of the water. Diversity of opinion as to many affairs of life answers, there is reason to believe, a valuable purpose, but applied to the results of scientific experiments when all the details are given with mathematical exactness, this diversity of opinion results only in encouraging the average reader in the belief that scientific investigations are shams, and that experiments in however a doubtful field, may be shown by mathematics to be successful if only there be a proper discernment exercised in the selection of the investigators.

Thus by various, in some cases quite unique processes of reasoning, the results given to the French Academy of Sciences by the committee appointed by the Mayor of Grenoble to estimate the work done by M. Deprez, indicate to the minds of the French, English and American critics all sorts of things. One journal says that the figures show a complete success for the attempt to transmit electrical power to a distance; that the amount of power collected from the running stream performed a valuable work in driving various mechanical contrivances without the interposition or fuel, and the problem of transmission of power, save as to a few unimportant details, is solved. Another French critic says that the result as given, over fifty per cent. recovered at the end of the second machine should, of a right, be reduced ten per cent. One English critic says it should be reduced twenty-five per cent.; another says thirty-five per cent., and that the results, from an economical point, are of no earthly value.

We won't say that any of these gentlemen are wrong, for we don't know whether they are or not, since we did not make the measurements by which such experiments should be judged. But until the contrary is proved, we will pursue our usual policy of trusting to official statements. Surely a body of experts chosen presumably for their fitness by the Mayor of Grenoble to apply scientific tests and measurements to Deprez's experiments may be expected to know more about these experiments than their countrymen who were not present at the trials, and more than the most distinguished critics on the other side of the English Channel.

Besides the pique which it has been alleged the English are in the habit of evincing when important discoveries are made in Gaul, or elsewhere out of England, there is a tendency toward incredulity in the latter country which would seem to forbid the acceptance of anything not in keeping with English scientific traditions. When the project of forcing illuminating gas through street mains was first broached, the English scientific world sent up a perfect howl of derision; when Capt. Ericsson towed the admiralty barge down the Thames with his propeller launch, the English naval authorities, after dozing over the subject for several months, decided that the substitution of the oblique for the direct action would interfere with a ship's steering-gear, and when it was proposed to send a ship from America across the ocean propelled by steam, an eminent scientest promised to swallow it on its arrival. We did not hear if he fulfilled his promise or not, but we did hear that steam navigation and the propeller were complete successes.

The experiments that have been made by M. Deprez in the transmission of electrical energy, whether they show that waste power may be economically collected and sent to a distance electrically or not, are of the utmost importance, and even if they do not prove the project already a commercial success, may from the excellent results obtained, not unreasonably be looked upon to do so in the near future.

But whether he succeeds or fails, Deprez's efforts will be none the less praiseworthy, and since he looks to the public for neither assistance nor applause, he has little to fear or hope from censure or from praise.

Telephone Signaling and Apparatus to do it With.

So long as telephones are used, so long must means be adopted by which the person desiring to talk, may attract the attention of his victim.

The first, the most obvious, and as it has turned out, the most impractical and expensive plan was to establish a normally closed battery circuit, with an ordinary electric single stroke bell, at each station, and to give the signal by breaking and closing the circuit the desired number of times. For example, if the central station wished to call station 21, the call would be made by breaking and making the circuit twice, then by pausing for a moment, and producing an additional make and break. This would give the signal 21, which could of course be repeated *ad libitum*. But the constant ringing of bells, soon resembled much study in that it became "a weariness of the flesh" to the subscriber; and it also dawned upon the optimistic intellect of the central office manager that the space taken up by his batteries was enormous, and that the care they required was outrageous.

At this time the magneto-bell, which had been considerably talked of, became an actual factor; and just as soon as it became evident that magneto-bells could be procured in quantity, and also that the apparently high first cost was soon made up by their superior work and durability, they were rapidly introduced both for new lines, and also as a substitute for the battery bell and an improvement on the older lines.

But who, out of the thousands who have made, set up, tinkered at, and used magneto-bells, have taken a thought as to what they are, why they are so named, and what principle they operate upon.

Let us consider a moment, and see what we can find out about them.

Some years ago, there lived in England a man who might have made himself rich, but who, for the sake of science, remained poor. This man almost at the outset of his career in the year 1831 discovered after many painstaking experiments that if a wire constituting a closed circuit was rapidly moved across the poles of a magnet, an electric current was developed in the wire, the direction of which depended upon whether the wire was moved to or from the magnet. It is almost needless to say that the name of this man was Faraday.

The electricity so developed, was at first regarded as a totally new manifestation of electricity, and hence was called "Magneto Electricity."

Later, however, it was ascertained that it was identical with electricity of the machine and of the battery.

Faraday was satisfied with having discovered the new way of developing electricity, and left it to others to find practical means of putting it into use. It is useless here to recapitulate the early forms of machines and their inventors, for they are legion, and they are reasonably well known. After lying dormant for many years, the discoveries of Faraday, amplified and improved by Wheatstone, Hjorth, Siemens, and Varley, brought forth fruit in the modern dynamo-electric machine, and a second and unique result shortly after appeared in the Gramme machine.

In all these machines the currents are produced of uniform direction, either by means of a peculiar form of winding or by the use of a commutator, which is a kind of back action pole-changer. That is to say, as what we now call a pole-changer takes the straight currents from a battery and changes them into a constant succession of rapidly-reversed currents, so the commutator intercepts the normally-reversed currents proceeding from the machine, and straightens them as to their direction in the external circuit by reversing the circuit terminals at the moment of the current reversal.

Not very many uses had, until the introduction of the telephone, been made of machines unprovided with commutators and evolving reversed currents.

Wheatstone used them in his telegraph machines, and Holmes employed them to produce the electric light, but the telephone call-bell has probably given the greatest impetus to this class of machine. When we undertake to look into the why and wherefores of the magneto bell as it is, we see from what has already been stated that the name is given to it because it generates and is operated by electrical currents produced by moving coils of wire near the poles of a magnet.

We also see that the complete instrument, although popularly called a bell, has a two-fold character.

Enclosed in a single case is an arrangement for generating or evolving magneto currents, and also an instrument for utilizing the said currents to give a signal. The first we customarily call "a generator;" the second, "a ringer."

The generator comprises a large compound horseshoe magnet, with a Siemens armature placed between its poles so as to be capable of rotation. The Siemens armature, as we all know, is a shuttle-shaped piece of iron, having a journal at each end adapted to rotate in bearings, and having a quantity of insulated wire wound on it, the two ends of which are brought out to connect with the external circuit. A small pulley is fixed on one end of the axis of the armature, and a large one is fixed in bearings above and is provided with a crank by which it is turned round. These pulleys sometimes work into one another by friction, sometimes are connected by a belt, and are sometimes replaced by a spur-wheel and pinion. The armature coil, which usually is of fine wire, and has consequently a considerable electrical resistance, is cut out of the circuit by a shunt wire, so that before any current generated in it can go to line, the short circuit must in some way be broken. Formerly this was manually effected by a button, which was to be pushed by one hand while the other hand was engaged in turning the crank; but the bells which have been made during the last few years have all been provided with an automatic attachment to the crank shaft, which by the first movement of the said shaft broke the short circuit.

So much, then, for the generator. Let us now consider the ringer. It consists of an ordinary electro-magnet in the same circuit as the generator when cut in, a small horseshoe permanent magnet clasping the electro-magnet and a soft-iron armature pivoted at its center, and adjusted in front of the electro-magnet poles. The centrally pivoted armature is not in actual contact with the permanent magnet, but is inductively polarized by it. A long bell-hammer is fixed to the armature, and vibrates between two gongs, which are fixed on the front of the bell-box.

The peculiar armature used in these bells was a happy thought, and resulted in the construction of one of the most powerful, as well as one of the most sensitive instruments for responding to rapid changes in the direction of currents when used to produce an audible signal. Several other devices are incorporated with the foregoing in the magneto-bell of to-day; such, for example, as the automatic telephone switch, and its accompaniment of the circuit closer for automatically closing the transmitter battery circuit. It is not necessary here to refer further to these devices.

The first way in which these bells were rung from a central office was by means of a similar bell placed in a convenient position for the operator, and located in a branch circuit, which could be switched on to any line.

The next move was due to the inspiration of some economical genius, and was the substitution of a generator only, dispensing with the bell part, which, of course, was in this connection a superfluity.

Still, the generator had to be mainly operated by means of a crank.

Shortly after the generator was arranged to be worked by a treadle, *à la* sewing-machine, and this was thought a wonderful achievement.

In the fall of 1879 and spring of 1880 a new wrinkle was evolved in the so-called power generator. The novel feature in this was the locating a generator of large size at some place where there was suitable power to keep the armature in constant rotation, and running a large leading-out wire from the generator to the exchange. At the exchange a normally open branch wire was led to each operator, and these branches could be closed on to any subscriber's line for calling.

Obviously, if power was obtainable in the same building, the advantage was great, as the main leading wire could then be greatly reduced in length. This improvement was a sweeping one and a great one, and its efficiency is attested by the fact that it is still the favorite method of supplying calling currents.

Yet certain faults gradually developed, which will be referred to presently. Coeval with the introduction of the power generator another method was in several exchanges (notably Milwaukee) introduced. This was to provide a calling battery of sufficient strength, and include an automatic pole-changer in the circuit of the wire leading therefrom, which wire was normally open, and branched to each required place, just as when the magneto-generator was used.

This arrangement was first brought to the notice of the writer by Mr. C. H. Haskins, of Milwaukee.

Each plan was favored by quite a number of exchange managers, and the latter received a considerable impetus upon the invention of the Warner pole-changer, and its introduction by the Western Electric Manufacturing Company. As might readily be supposed, each party found that their favorite device was by no means perfect; the power magneto generator when made to supply a good many circuits, and several at the same time, was found to produce a current which did not readily split; consequently when several subscribers were being called at once, especially when some of the circuits were short and others long, the current going to the longer ones was not of sufficient volume to perform its work.

To remedy this, the generator was run at a higher speed; and soon the deleterious result of such a measure was seen, in the rapidity with which the apparatus would get out of order. Besides, there is a limit to the speed with which the polarized armatures of the bells can respond to the alternations of current.

A second alternative was then thought of; instead of making one large generator do the work, a series of small sized ones were employed, and thus the work was divided.

In some cases, this worked very well, but it is obvious that if the best results could be obtained from a single machine, that would be better, as being more compact, and as requiring less apparatus.

Returning to the battery and pole-changer, the chief disadvantage appears to be the violent induced currents induced in parallel wires during its use; although a secondary disadvantage is the care which a battery demands, and the more or less rapid wear and tear inseparable from constant motion, especially where circuit closing and breaking are concerned.

After a careful survey of the whole subject, the writer of this article has come to the following conclusion:

That as yet, the most economical generator has not been produced. Instead of increasing speed of rotary motion, or of dividing the machine up into half a dozen, it seems natural to suppose that if a generator were constructed with large magnets, and with an unusually large and wide armature cylinder, so that an armature both very long and very wide could be used, a low speed might be maintained, and yet a current of great force and volume produced; for as the five foot driver of a locomotive will traverse a longer space with a single revolution, than a four foot driver can possibly do, so a Siemens armature having a diameter of three inches, will necessarily cross more lines of force with a given rate of speed, than an inch and a-half armature can do; and thus the ruinous effects of high speed can be avoided, and the generator will not outrun the ringer armature.

It seems judicious then to construct a generator with large magnets, and long and wide armatures; to provide the best and largest ground and leading out wires; to provide a battery and pole-change, for cases of emergency, and for times when motive power is unobtainable; and moreover to arrange several hand generators so as to be easily connected in case both power generator and pole-changer should give out.

It may be noted here, that in places where suitable power cannot be procured, a gas engine, or better still, a water motor may be successfully employed.

TRANSMISSION OF ELECTRICAL ENERGY.

The Experiments at Grenoble.

OFFICIAL REPORT OF THE COMMISSION TO THE ACADEMY OF SCIENCES—THE THIRD AND LATEST EXPERIMENTS OF M. MARCEL DEPREZ—THE SAME APPARATUS USED AS AT THE "CHEMIN DE FER DU NORD"—THE TRANSMITTING WIRE ALONE CHANGED—A RECORD OF THE GROSS AND NET WORK AND THE MEAN PERCENTAGES OF EACH EXPERIMENT.

[Translated for the New York ELECTRICAL REVIEW, from *Bulletin de la Compagnie Internationale des Téléphones*, by Franklin H. North.]

The commission named by M. Rey to carefully examine and report upon the recent experiments of M. Marcel Deprez, has acquitted itself of its task in a most praiseworthy manner.

During the early part of September the Academy of Sciences received a report from M. Bertrand, and accompanying it some very flattering comments on M. Deprez's system of electrical transmission of power. We are thus to-day enabled to obtain from these authentic documents some idea of just what progress has thus far been made in this very interesting subject.

We will not pretend that the transmission of seven horse-power electrically to a distance of fourteen kilometers solves the problem of electrical transmission of power, from an industrial point of view, but only that such a success in this field gives a not unreasonable assurance of still more satisfactory results in the near future.

Heretofore we have described in detail the apparatus employed by M. Deprez. It is at this time only necessary to state that the reception was at Grenoble, and that the generator was placed in the manufactory of Damaye & Co., near the railway station of Vizelle, where it was operated by a turbine. The two electrical machines were distant fourteen kilometers the one from the other. Two wires of bronze-silicum, of two millimeters diameter, were employed to conduct the current, the line having a resistance of 167 ohms. The machines were the same as those used in the trials at the *Chemin de Fer du Nord* last March, but the wires of the inductors of the receptor had been changed, the isolation of the various parts being more perfect. The two machines were isolated from the ground by the interposition of dry wood. The resistance, frequently measured, was 56.7 ohms for the generator and 97 ohms for the receptor.

The commission had at its disposition no other apparatus for the inspection of the work rendered but the brakes of Prony, and we hesitate to complain of this lack, because it was thus led to confine its observations to dynametrical measurements, and to give to these a careful attention. The numerous verifications which were made during the progress of the experiments seem to have justified the method adopted to determine the amount of work absorbed by the generator, and the amount of power recovered or rendered by the receptor.

The turbine, which worked the shaft, was coupled to the same by the interposition of cog-wheels; the shaft transmitted its movement to the generator. The brake was mounted upon the shaft, the usual precautions being taken to make it effective. In order to be the more certain, the sensibility of the apparatus was to such an extent exaggerated that a weight of 50 grammes sufficed to destroy the equilibrium when the charge was 54 kilogrammes.

We have not been told what was the permanent charge of the brake, and to this omission should be attached a slight importance.

The commission has calculated the work for the two electrical machines by the following formula:

$$T = \frac{2\pi LNP}{4{,}500}$$

in which L, N, P represent the length of the arms of the lever, the number of revolutions of the shaft, and the charge in kilogrammes during the experiments, and T the work in horse-power of 75 kilogrammeters per second.

The operations were conducted in the following manner:

The turbine was put in motion at Vizelle. At first turning only the balance wheel and the equilibrium of the brake was secured by a charge P, by increasing the number of revolutions N. Then, with a weight p, the pulley-brake of the receptor at Geenoble was charged, and the generator at Vizelle was carefully lubricated. The equilibrium being now destroyed, is re-established in such a manner as to exactly reproduce the same number of revolutions N at the departure, or by diminishing the primitive charge P. That done, the indications of the two brakes are noted simultaneously.

With these conditions, say the commission, the work dispensed by the generator and the return or the gross work of the motor was proportioned to the difference of the charges of the brake at Vizelle, and the total work of the turbine suffered no variation during the experiments.

Care was taken at the close of each experiment to make sure that the operation of measurement presented sufficient guarantees of exactness. The following is a *resumé* of results:

1. Speed of brake-shaft, 110 revolutions; gross work of motor, 8.3 horse-power; power recovered at the receptor, 3.51 horse-power; mean amount of transmission, 43.9 per cent.

2. Speed of brake-shaft, 130 revolutions; gross work of motor, 10 horse-power; work recovered at the receptor, 4.46 horses; mean amount of transmission, 47.9 per cent.

3. 8peed of brake-shaft, 145 revolutions; gross work of motor, 10.32 horse-power; mean work recovered at receptor, 5.44 horse-power; mean amount of transmission, 54.7 per cent.

4. Speed of brake-shaft, 160 revolutions; gross work of motor, 11.39 horse-power; mean work recovered at receptor, 6.18 horse-power; mean amount of transmission, 56 per cent.

5. An exceptional experience. Speed of brake shaft, 170 revolutions; gross work of motor, 11.56 horse-power; work recovered at receptor, 6.97 horse-power; mean amount of transmission, 62.3 per cent.

The speed measured at the generator was 727, 868, 964, 1,042 and 1,140 revolutions, and the corresponding speed of the receptor, 445, 586, 686, 781 and 875 revolutions. The maximum readered was obtained in each series of experiments for a charge of six kilogrammes at the brake of the receptor.

The results obtained prove that M. Marcel Deprez has profited by the criticisms which have been made up to the present time, and has been exceedingly fortunate in effecting a better arrangement of the machines.

We abstain from all discussion of the results obtained. We will not permit ourselves to doubt the correctness of the report rendered by the Grenoble Commission, and we can rest assured that the Academy of Science, to which the report has been delivered, to judge of the series of experiments intelligently and impartially.

It seems necessary, however, to call attention to an error, which can be explained only by the precipitation of the report in *Comptes Rendus*.

NEW PATENTS—ELECTRICAL—1883.

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING OCTOBER 16, 1883.

286,577 Apparatus for counter-balancing disturbances in telephones; Alex. Bernstein, Boston, Mass.

286,581 Electrical low water alarm; John E. Blake and Charles A. Hall, New York, N. Y.

286,595 Telephone exchange system; George F. Durant, St. Louis, Mo.

286,612 Dynamo electric machine; Edwin J. Houston, Philadelphia, Pa., assignor to the Thomson-Houston Electric Co., New Britain, Conn.

286,667 Printing telegraph; Aloys Wirsching, Brooklyn, N. Y.

286,681 Acoustic and electric insulator; William J. Bowen, Norwalk, Ohio, assignor to himself, T. T. Keckeler, Cincinnati, Ohio, and Z. C. Thiving, Marshall, Mich.

286,696 Telegraph cable; Wm. P. Henley, Plaisted, County of Essex, England, George Henley and Sydney Gedge, executors of said Henley, deceased.

286,722 Thermometric electric circuit closer; Morris Martin, Malden, Mass.

286,737 Telephone; George R. Shepherd, Hartford, assignor of one-half to William Edgar Simonds, Canton, Conn.

286,796 Process of making electric conductors; Thos. Egleston, New York, N. Y., assignor to the Plume & Atwood Manufacturing Co., Thomaston Conn.

286,801 Insulator; Bradley A. Fiske and Samuel D. Mott, New York, N. Y.

286,809 Galvanic battery; Alfred Hald, Rahway, N. J.

286,829 Insulating wrapper for grouped electrical conductors; John H. Kohmescher, Cincinnati, Ohio.

286,833 Apparatus for controlling electric currents; Maurice Levy, Paris, France.

286,834 Electrical regulator for controlling the current in electrical currents; Maurice Levy, Paris, France.

286,841 Electric governor; Edward B. Parkhurst Woburn, assignor to himself and Albert L. Parcelle, Boston, Mass.

286,861 Laying underground telegraph wires; Francis M. Speed, Walla Walla, Washington.

286,867 Duplex telegraphy; Benjamin Thompson, Buffalo, N. Y.

286,873 Electro magnetic motor; Silvanus F. Van Choate, Boston, Mass.

286,875 Receiver for telephones; Henry E. Waite New York, N. Y.

286,876 Telephone receiver; Henry E. Waite, New York, N. Y.

286,888 Electro magnetic alarm; Alvah Wiswall, Cincinnati, Ohio, assignor by direct and mesne assignments to Frederick Voelckel, same place.

286,916 Incandescent electric lamp; Desmond Gerald Fitz Gerald, Brixton, County of Surrey, England.

286,917 Double current relay or electro magnet; Arthur C. Fraser, Brooklyn, N. Y.

286,923 Telephone transmitter; Charles D. Haskins, New York, N. Y., assignor to Western Electric Co., Chicago, Ill.

286,925 Electric arc lamp; David J. Hauss, Timothy E. McNamara and James C. Zerbe, Cincinnati, Ohio, assignors to the American Union Electric Co., same place.

286,937 Electrical wire insulator; John F. Martin, Chicago, Ill.

286,938 Conduit for electric wires; John F. Martin, Chicago, Ill.

286,939 Underground distributor for electric wires; John F. Martin, Chicago, Ill.

286,940 Conduit for electric wires; John F. Martin, Chicago, Ill.

286,941 Coupling for tubular insulators for electric wires; John F. Martin, Chicago, Ill.

286,942 Distributor for electric wires; John F. Martin, Chicago, Ill.

286,943 Means for supporting insulators for electric wires in underground conduits; John F. Martin, Chicago, Ill.

286,944 Insulator for underground electric conductors; John F. Martin, Chicago, Ill.

286,945 Conduit for electric conductors; John F. Martin, Chicago, Ill.

286,946 Insulator for electric wires; John F. Martin, Chicago, Ill.

286,947 Insulator for underground electric conductors; John F. Martin, Chicago, Ill.

286,948 Underground multiple wire cable; John F. Martin, Chicago, Ill.

286,949 Distributing box for electric wires; John F. Martin, Chicago, Ill.

286,953 Voltaic arc lamp; Otto A. Moses, New York, N. Y.

286,955 Telegraph relay; Michael J. O'Sullivan, Baltimore, Md., assignor of three-fourths to J. Frank Morrison, same place.

286,963 Electrical conductor; Thomas S. Reed, Bridgeport, Conn., assignor to the Bridgeport Brass Co., same place.

286,970 Combined enunciator and alarm system; Elmer A. Sperry, Cortland, N. Y.

286,977 Printing telegraph; Henry Van Hoevenbergh, Elizabeth, N. J., assignor to the Western Union Telegraph Co., New York.

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Hudson River Telephone and Telegraph Company	110
Long Island and New Jersey Telephone Company	100
Mexican Telephone Company	2½
National Bell Telephone Company of Maine	90
New York and Pennsylvania Telephone Company	100
Northwestern Telephone Company	100
Southwestern Telephone Company	68
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Southern Bell Telephone and Telegraph Company	125
Tropical Telephone Company	3
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United Telephone Company (Kansas and Missouri)	80
Bell Telephone Company, of Missouri	165
Wisconsin Telephone Company	125
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Great Southern Telephone Company	100
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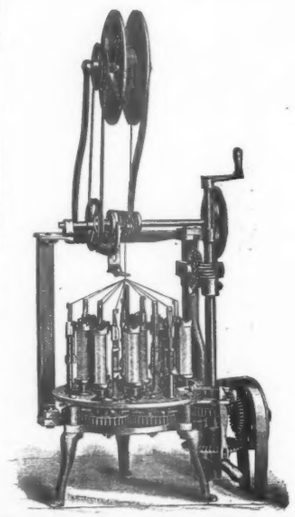

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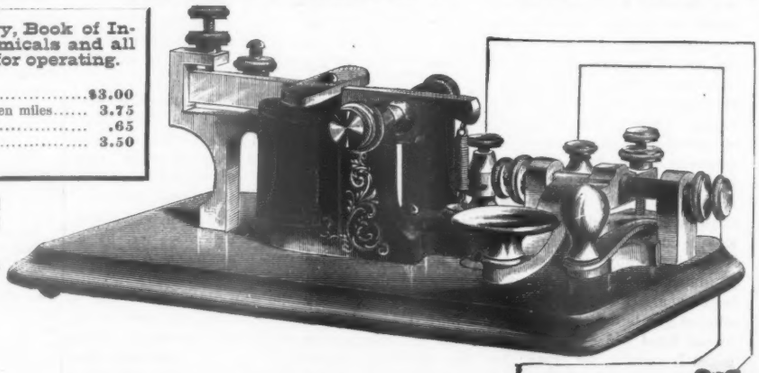

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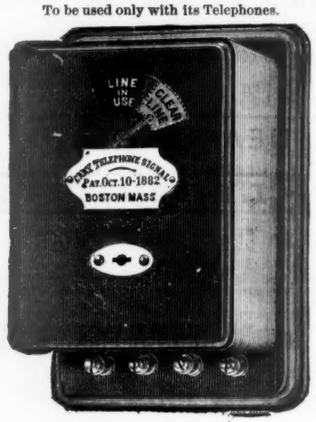

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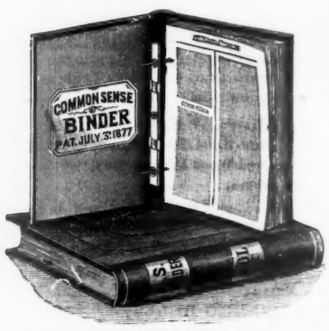

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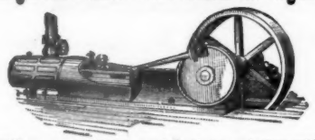

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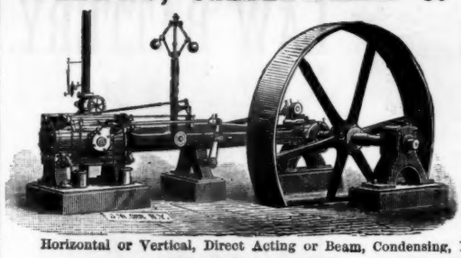

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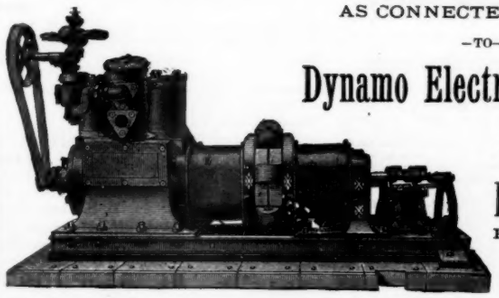

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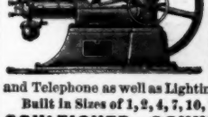

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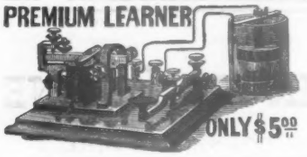

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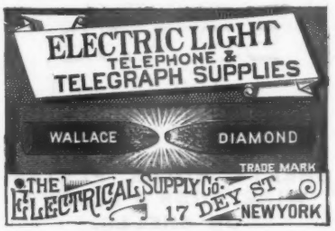

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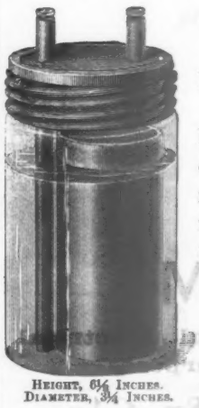

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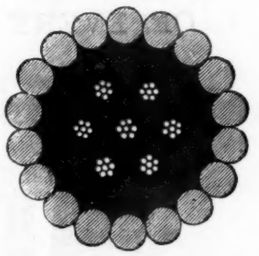

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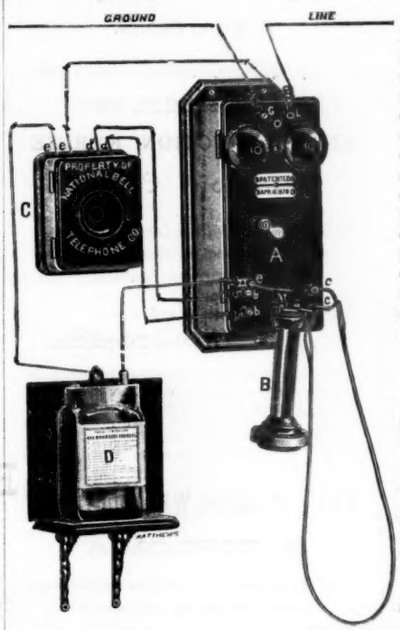

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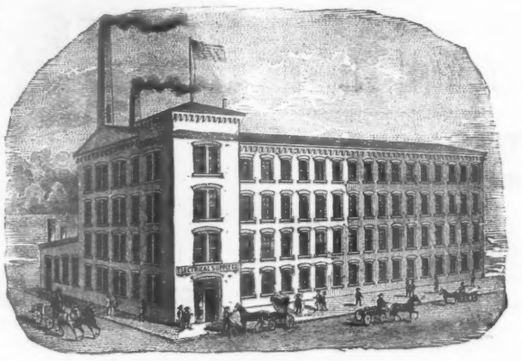

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